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July 30, 2020

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Subject: Draft 2019 Annual Performance and Effectiveness Monitoring Report
Pole Canyon NTCRAs, Smoky Canyon Mine

Dear Art,

This submittal by J.R. Simplot Company provides the *Draft 2019 Annual Performance and Effectiveness Monitoring Report (PEMR) for the Pole Canyon Non-Time-Critical Removal Actions (NTCRAs)*. This report fulfills the annual reporting requirements for both the 2006 Water Management NTCRA and the 2013 Dinwoody/Chert Cover NTCRA under their respective Administrative Settlement Agreement and Order on Consent/Consent Orders.

The PEMR describes the inspection, operation and maintenance, and performance evaluation activities conducted for the NTCRAs in accordance with the 2009 and 2016 *Post-Removal Site Control (PRSC) Plans* and provides the performance evaluation results. Effectiveness monitoring activities conducted for surface water and groundwater in accordance with *Pole Canyon Effectiveness Monitoring Plan Revision No. 5* are described and results are provided. The PEMR also includes an evaluation of the overall effectiveness of the NTCRAs in terms of estimated reductions in selenium mass transport from the Pole Canyon ODA.

This deliverable is available for electronic download at the following website:

(b) (6)

Login: (b) (6)
Password: (b) (6)

Please contact me if there are questions regarding this submittal.

Sincerely,

Jeffrey Hamilton
Environmental Engineer

cc: (1 copy except as otherwise noted)
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**DRAFT**

# 2019 Annual Report
# Pole Canyon Non-Time-Critical Removal Actions
# Performance and Effectiveness Monitoring

## Smoky Canyon Mine
## July 2020

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| | |
|---|---|
| % | percent |
| ASAOC | Administrative Settlement Agreement and Order on Consent/ Consent Order |
| BLM | United States Department of Interior Bureau of Land Management |
| cfs | cubic feet per second |
| cm/sec | centimeters per second |
| EDS | Energy Dissipation Structure |
| EMP | Effectiveness Monitoring Plan |
| F | Fahrenheit |
| HDPE | High-Density Polyethylene |
| HELP3 | Hydrologic Evaluation of Landfill Performance |
| IDAPA | Idaho Administrative Procedures Act |
| IDEQ | Idaho Department of Environmental Quality |
| Ks | Saturated Hydraulic Conductivity |
| lbs | pounds |
| lbs/day | pounds per day |
| Mine | Smoky Canyon Phosphate Mine |
| mg/L | milligrams per liter |
| NTCRA | Non-Time-Critical Removal Action |
| ODA | Overburden Disposal Area |
| O&M | Operations and Maintenance |
| PEMR | Performance and Effectiveness Monitoring Report |
| PRSC | Post-Removal Site Control |
| Rev | Revision |
| SNOTEL | Snow Telemetry |
| Tribes | Shoshone-Bannock Tribes |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFS | United States Department of Agriculture Forest Service |
| USFWS | United States Department of Interior Fish and Wildlife Service |

# 1.0 INTRODUCTION

This 2019 Performance and Effectiveness Monitoring Report (PEMR) presents the results of the annual performance and effectiveness monitoring activities for the Pole Canyon Overburden Disposal Area (ODA) Non-Time-Critical Removal Actions (NTCRAs) implemented at the J.R. Simplot Company (Simplot) Smoky Canyon Phosphate Mine (Mine). The Mine is located approximately 24 miles east of Soda Springs in Caribou County, Idaho (Figure 1-1).

## 1.1 Pole Canyon ODA Non-Time-Critical Removal Actions

The Pole Canyon ODA is a cross-valley fill consisting of run-of-mine overburden (waste rock containing seleniferous shales) covering approximately 120 acres of lower Pole Canyon, including the original Pole Canyon Creek channel (Figure 1-2). Most of the overburden in the Pole Canyon ODA originated from Panel A, which was mined from 1985 until 1990. A much smaller portion of the overburden came from Panel D and was placed on the west side of the ODA in 1997. Reclamation of portions of the Pole Canyon ODA took place in 1989 and 1990, and again in the late 1990s.

Two NTCRAs have been implemented at the Pole Canyon ODA. The first, the Pole Canyon Water Management NTCRA (2006 NTCRA), was implemented in accordance with the Administrative Settlement Agreement and Order on Consent/Consent Order (ASAOC) entered into by the United States Department of Agriculture (USDA) Forest Service (USFS), United States Environmental Protection Agency (USEPA), Idaho Department of Environmental Quality (IDEQ), and Simplot (USFS, USEPA, and IDEQ 2006). The second, the Pole Canyon Dinwoody/Chert Cover NTCRA (2013 NTCRA), was implemented under a separate ASAOC entered into by the USFS, IDEQ, the Shoshone-Bannock Tribes (Tribes), and Simplot (USFS, IDEQ, and Tribes 2013).

The USFS is the Lead Agency for conducting response actions at the Site. Collectively, the Agencies involved in lead or support roles for one or both of these NTCRAs, including the USFS, USEPA, IDEQ, Bureau of Land Management (BLM), United States Fish and Wildlife Service (USFWS), and the Tribes, are referred to in this report as the “Agencies.”

### 1.1.1 2006 NTCRA

The general objectives of the 2006 NTCRA were addressed by three major construction components (Figure 1-2):

- Bypass pipeline to convey diverted Pole Canyon Creek flow around the Pole Canyon ODA.

- Infiltration basin to direct the upstream Pole Canyon Creek flow, between the bypass pipeline inlet and the ODA along with creek flows in excess of the pipeline capacity, into the Wells Formation aquifer on the upstream side of the ODA.

- Run-on control channel adjacent to the northern edge of the ODA to direct run-on from the adjacent slopes into Pole Canyon Creek downstream of the ODA.

Construction of the bypass pipeline and infiltration basin was completed in 2007, and the run-on control channel was completed in 2008.

***Bypass Pipeline*** – The bypass pipeline conveys surface water via gravity flow from the uppermost 615 acres (approximately 60 percent) of the upper Pole Canyon Creek watershed around the ODA and discharges this water back into the creek channel below the ODA. The creek flows into the pipeline via an inlet structure that is designed to prevent sediment and debris from entering the pipeline. If the creek flow is greater than the pipeline capacity (44 cubic feet per second [cfs]), the excess water flows down the original creek channel to the infiltration basin directly upstream (west) of the ODA.

Locations of the concrete inlet and outlet structures are shown on Figure 1-2. Total length of the bypass pipeline is approximately 10,400 feet between the inlet and outlet. The pipeline is constructed of 32-inch outside diameter, smooth walled high-density polyethylene (HDPE) pipe and is buried between 5 and 15 feet below ground surface along the entire length. Access points (manholes) are present approximately every 1,000 feet. The outlet structure is located approximately 1,000 feet downstream of the toe of the Pole Canyon ODA and consists of a concrete outfall with a concrete baffle block for energy dissipation to limit scour and erosion of the stream channel below the outfall. Pipeline flow is monitored continuously at the inlet and outlet structures with weirs, pressure transducers, and data loggers.

***Infiltration Basin*** – The infiltration basin captures runoff from approximately 487 acres (40 percent) of the upper Pole Canyon Creek watershed between the bypass pipeline diversion inlet and the upstream toe of the ODA. During infrequent, unusually wet years, excess flows bypass the diversion system and the water is stored temporarily in the infiltration basin and then infiltrates into the underlying Wells Formation. Under normal operating conditions, water does not pond in the infiltration basin.

The storage capacity of the infiltration basin was determined based on elevation data from the construction as-built information, with a minimum basin floor elevation of 7,175 feet. A 5-foot contour interval was used in the average end-area calculations, resulting in storage of 1.3 acre-feet at a water depth of 5 feet and 51 acre-feet at a water depth of 45 feet (Formation 2012). The maximum storage volume corresponds to the elevation contour matching the top of the synthetic liner on the west-facing slope of the ODA.

The infiltration basin was constructed on Wells Formation bedrock directly upstream of the ODA by scraping the alluvial material off and blasting the Wells Formation to create a permeable basin floor. A synthetic liner was installed on the east side of the basin on the west-facing slope of the ODA, from the basin floor to a height of approximately 45 feet, to prevent movement of water from the basin directly into nearby overburden (NewFields et al. 2009) in the unusual condition in which the pipeline capacity of 44 cfs is exceeded. Flow along upper Pole Canyon Creek has not exceeded pipeline capacity since continuous flow monitoring of the pipeline began.

A sedimentation basin was constructed directly upstream of the infiltration basin to limit the amount of sediment entering the infiltration basin that could ultimately reduce the rate of infiltration through the basin floor over time. A flume, pressure transducer, and data logger were installed within the creek channel directly upstream of the sedimentation basin at monitoring location UP-IN in early 2009 to monitor creek flow entering the infiltration basin.

***Run-On Control Channel*** – The run-on control channel intercepts runoff from an upslope area of approximately 95 acres on the hillside adjacent to the ODA to the north and diverts the water around the ODA and back to the Pole Canyon Creek channel below the ODA in order to prevent water from contacting overburden material. The run-on control channel was designed to intercept and convey runoff generated by a 100-year, 24-hour storm event (NewFields 2009). Total length of the run-on control channel is approximately 1,135 feet. The upper portion of the channel is relatively low gradient and is lined with turf reinforcement mat to limit erosion during high-flow events. The lower portion of the channel is a relatively steep chute that drops down the north hillside adjacent to the east face of Pole Canyon ODA and is armored with articulated concrete block panels to limit erosion due to potentially high flow velocities in this portion of the channel.

### 1.1.2 2013 NTCRA

The general objectives of the 2013 NTCRA were addressed by two construction components (Figure 1-3):

- Dinwoody/Chert cover system to reduce or eliminate the amount of water that infiltrates into the ODA due to direct precipitation, reduce or eliminate the potential for ecological risk due to ingestion of vegetation on the ODA, and reduce or eliminate the potential for risk to human receptors due to ingestion of vegetation and ingestion of and direct contact with ODA materials.

- Storm water run-on/runoff controls to eliminate the release of contaminants from the ODA via sediment transport.

Construction of the cover system and storm water controls was completed in 2015, with minor follow-up construction performed in 2016.

***Dinwoody/Chert Cover System*** – The Dinwoody/Chert cover system consists of a 3-foot-thick layer of fine-to-medium grained Dinwoody material with some gravel overlying a 2-foot-thick gravel chert layer that was designed with a saturated hydraulic conductivity (Ks) of $1x10^{-4}$ centimeters per second (cm/sec) or less. The cover was revegetated with native non-selenium-accumulating species to control erosion and facilitate evapotranspiration. A portion of the east-side top area of the ODA contains a gravel-covered zone used by Simplot as a blast compound and miscellaneous equipment storage area. Gravel road base was placed over the soil cover to provide an adequate driving surface in that area.

***Storm Water Run-on/Runoff Controls*** – Run-on and runoff controls are comprised of ditches, channels, chutes, berms, swales, culverts, and associated energy dissipation structures (EDS) that capture and collect flows from adjacent, topographically higher areas and convey the flows around the Pole Canyon ODA (Figure 1-3). Captured runoff from the ODA is conveyed to one of several sedimentation basins. Water conveyance features were designed for a 100-year, 24-hour storm event, and water retention features were designed for a 2-year, 24-hour storm event.

## 1.2 Monitoring Objectives and Purpose of Report

The purpose of this 2019 Annual Performance and Effectiveness Monitoring Report is to provide a summary of the Operation and Maintenance (O&M) activities and findings, the performance evaluation results, effectiveness monitoring results, and the effectiveness evaluation for the 2006 NTCRA and 2013 NTCRA in one combined annual report.

The performance monitoring and O&M requirements are:

- Semiannual inspections of the 2006 and 2013 NTCRA to verify that the components are performing as designed and to identify any maintenance or repair needed. The *Pole Canyon Overburden Disposal Area 2013 Non-Time-Critical Removal Action Post Removal Site Control Plan* (2013 NTCRA PRSC Plan) (Formation 2016) requires semiannual inspections of the soil cover system and storm water run-on/runoff controls for the first three years following construction and then annual inspections thereafter. Semiannual inspections of the 2013 NTCRA have been performed since fall 2016. The inspection frequency will be reduced to annual staring in spring 2020.

- Annual maintenance to provide for long-term performance and integrity of the NTCRA components.

The effectiveness monitoring requirements are:

- Surface water monitoring at LP-1 (seepage from the downstream toe of the ODA), lower Pole Canyon Creek station LP-PD, North Fork Sage Creek stations NSV-5 and NSV-6, and LSV-1 (below confluence of Sage Creek but above the confluence of Hoopes Spring), as well as two locations upstream of the ODA – at UP-PD (upstream of the pipeline inlet) and UP-IN (upstream of the infiltration basin), to assess the effectiveness of the NTCRAs in decreasing selenium transport from the Pole Canyon ODA to surface water.

- Groundwater monitoring locations in alluvium (GW-15, GW-22, and GW-26) and in the Wells Formation (GW-16) that are downgradient of the Pole Canyon ODA but upgradient of potential transport pathways from other source areas to assess the effectiveness of the 2006 and 2013 NTCRAs in decreasing selenium transport from the ODA to groundwater.

- Vegetation monitoring at six locations (Zones 1 through 6) on the Pole Canyon ODA Dinwoody/Chert cover system once in 2018 to evaluate the effectiveness of the 2013 NTCRA in reducing or eliminating risks due to ingestion of vegetation growing on the cover after vegetation has become established. Results were provided in the *2018 Annual Performance and Effectiveness Monitoring Report* (Formation 2019). Because post-NTCRA selenium concentrations in vegetation have decreased relative to pre-NTCRA concentrations, the 2013 NTCRA is effective at reducing or eliminating the potential risks via ingestion of vegetation and no cover modifications or additional vegetation community monitoring or sample collection were needed in 2019.

## 1.3 Report Organization

This Performance and Effectiveness Monitoring Report is organized as follows:

| | |
|---|---|
| Section 2 | Summary of inspections and maintenance/repair actions and discussion of pipeline flow evaluation |
| Section 3 | Description of effectiveness monitoring activities and presentation of effectiveness monitoring results |
| Section 4 | Presentation of statistical analysis results, and water-balance and mass-balance results |
| Section 5 | Summary of performance evaluation and effectiveness monitoring results |
| Section 6 | References cited. |

# 2.0 PERFORMANCE EVALUATION

Performance evaluation for the bypass pipeline, infiltration basin, and run-on control features is conducted in accordance with the *Pole Canyon Water Management Removal Action Post-Removal Site Control Plan* (2006 NTCRA PRSC Plan) (NewFields 2009). The 2013 NTCRA Dinwoody/Chert cover system is evaluated as per the 2013 NTCRA PRSC Plan (Formation 2016). The performance evaluation activities completed in 2019 for the NTCRAs were formal and informal inspections, and maintenance and repair actions. Additionally, a bypass pipeline inflow/outflow comparison was performed for the 2006 NTCRA.

## 2.1 Inspections

There were no weather or seismic events in 2019 large enough (e.g., 100-year, 24-hour storm event with 2.9 inches of precipitation or seismic event greater than or equal to magnitude 6) to trigger an immediate inspection of the NTCRA components. Also, no logging, forest fires, or development activities occurred that would trigger additional inspections.

Two formal inspections were performed for the 2006 NTCRA, the first on May 21 and the second on November 4. Two formal inspections of the 2013 NTCRA were completed on June 11 and November 14. Inspection forms and photographs that document the condition of the NTCRA components and identify maintenance/repairs needed and maintenance procedures implemented are provided in Appendix A. Photographs documenting the repairs are also provided in Appendix A. Informal inspections were performed during the course of the year when Mine personnel were in the vicinity of the Pole Canyon ODA for other activities. Inspections and maintenance/repairs actions are summarized in the following sections.

### 2.1.1 Spring Inspection – 2006 NTCRA

Inspection of the bypass pipeline including the inlet and outlet structures, sedimentation basin and infiltration basin, and run-on control channel for the 2006 NTCRA was performed by Len Mason (Formation) on May 21, 2019. Weather conditions during the spring inspection were partly cloudy to overcast.

Inspection of the pipeline alignment, including access points and vents, found that it was in good condition (Appendix A). No areas requiring maintenance or repairs were identified.

Inspection of the bypass pipeline inlet structure found that it was in good condition and the concrete was stable and free of cracks. Some debris was present on the grizzly screen. The debris was removed, and the sediment flushed from the inlet structure at a later date. Repairs made the previous year to prevent water from flowing beneath the inlet structure were observed to be in good condition and no water was flowing beneath the inlet structure concrete. Water was flowing evenly over the weir notches. Riprap upstream of the pipeline inlet was in good condition, indicating that the rock remained stable as protection against channel erosion in this reach of upper Pole Canyon Creek.

Inspection of the pipeline outlet dissipation structure, discharge weir, and staff gage found that they were generally in good condition. The concrete was stable and free of cracks. No sediment was present in the invert. The steel discharge weir was in good condition. The staff gage and data logger were in good condition and the data logger was operating correctly.

Inspection of the sedimentation basin, spillway, and infiltration basin found that the basins were in good condition. The spillway contained no sediment and there was no displacement of any of the riprap due to high-flow events. Minimal sediment was present in the sedimentation basin and vegetation adjacent to the basin was adequate. No signs of depressions or sinkholes were present at the time of inspection. Some erosion (minor rilling) was observed on the west slope above the infiltration basin due to water running down the access road.

Inspection of the run-on control channel found that it was in good condition with no maintenance or repair required. Vegetation was established along the channel. No water was present within any portion of the run-on control channel and minimal sediment had accumulated in the sedimentation basin and downstream channel. Erosion along the steep chute of the channel was minimal.

### 2.1.2 Spring Inspection – 2013 NTCRA

The spring inspection of the cover system, access roads, drainage control features, sedimentation basins, and reclaimed borrow area for the 2013 NTCRA was performed by Jeff Hamilton (Simplot), Ron Quinn (Simplot), Lori Lusty (Simplot) and Art Burbank (USFS) on June 11, 2019. Weather conditions during the spring inspection were sunny and the cover system, drainage control features, and sedimentation basins were free of snow.

Inspection of the cover system found that the cover and the vegetation were generally in good condition (Inspection Form 1, Appendix A). A slump on the west-side cover system that was repaired in 2017 has been stable since the maintenance was completed and no further slope movement or erosion was observed in 2019. Vegetation growth was satisfactory in the areas of the upper east-side that were repaired and reseeded in 2018. Some further rilling occurred in areas of the upper east-side slope that was repaired in 2018. Installation of additional wattles and wood straw mulch were identified as maintenance items to prevent further erosion of the area. Wattles placed in rills and gullies on the south east-side slope in 2018 were still in good condition, preventing further erosion and allowing vegetation to establish in the reseeded areas. Only minor erosion was observed in the southeast seep zone. Temporary erosion-control features were generally in good condition and prevented rill development on cover slopes. Cover vegetation appeared generally in good condition.

The inspection found that the west-side cover drainage control features were generally in good condition with maintenance or repairs needed in some areas (Inspection Form 2, Appendix A). Minor sedimentation was noted in the west EDS and was identified for removal as part of regular O&M. The run-on and runoff ditches were generally in good condition. Minor erosion and sedimentation were observed in the south runoff ditch to the west-side south sedimentation basin and the discharge ditch from the west-side south sedimentation basin.

The east-side cover drainage control features and east-side haul road runoff system were in good condition (Inspection Form 3, Appendix A). Vegetation was established, no water was present within any portion of the channels/ditches, no erosion or sedimentation was observed, and the turf reinforcement mat, riprap, and grouted riprap were in good condition with no signs of cracking or removal by high-energy flow events. Inspection of the east EDS revealed that a significant amount of sediment had accumulated in the dissipation structure and was identified for removal as part of regular O&M.

The sedimentation basins, including pipe outlets and spillways, on both the west-side and east-side covers were in good condition (Inspection Forms 4 and 5, Appendix A). No cracks, sloughing, or other stability issues were detected in the sedimentation basins and pipe outlets and spillways. No erosion was observed along the basin inlet or outlet structures. Water was present within the west sedimentation basin at a depth of about 2 feet. Minimal sediment occurred along the edge of the west-side south and northwest sedimentation basins. Spillways were generally free of debris. Erosion was observed along steep parts of the access road to the west sedimentation basin. The gullies need to be filled and water bars along the road repaired to prevent further erosion. A minor amount of water was present in one end of the south-central sedimentation basin and about 1 foot of water was present within the saddle basin. The sediment depth was not measured and about 1 foot of water was present in the second cell of the infiltration basin. No water and only a minor amount of sediment were observed within the east sedimentation basin. Vegetation growth around the sedimentation basins was generally well established. In the saddle sedimentation basin, the vegetation was not well established, but coverage is increasing.

The Dinwoody borrow area and associated run-on ditches and sedimentation basins were in good condition (Inspection Form 6, Appendix A). No signs of instability, erosion, or significant sedimentation were evident. No debris was present in the ditches and the turf reinforcement mats were in good condition. A water depth of approximately 2 to 2-½ feet was present in the north and south sedimentation basins. The access road on the north side was in good condition; however, some minor gullies were evident on the south access road. Vegetation growth in the north sedimentation basin was minimal; however, vegetation in the south sedimentation basin was becoming more established. Vegetation coverage in the north and south borrow areas was well established.

### 2.1.3 Summer Maintenance and Repair Actions

Maintenance and repair actions were identified during the spring 2019 inspection of the 2013 NTCRA Dinwoody/Chert cover system components. No maintenance or repair actions were identified for the 2006 NTCRA water management components. Photographs of items undergoing maintenance and repair actions are included in Appendix A (Fall Inspection, Pole Canyon 2013 NTCRA). The following repair/maintenance actions took place in 2019:

- Wood straw mulch was installed along the upper east-side slope to reduce the potential for further erosion and the area was hand seeded.
- Accumulated sediment was removed from the west EDS as part of regular O&M.
- Accumulated sediment was removed from the east EDS as part of regular O&M.
- Rills along the access road to the west sedimentation basin were filled and water bars were installed to move runoff from the road. These water bars were removed during fall 2019 to facilitate abandonment of a well near the west sedimentation basin and will be reinstalled in summer 2020 as conditions allow.
- Noxious weed control was performed and targeted species including musk thistle, Canada thistle, spear thistle, and houndstongue. Milestone® at 15 gallons per acre was applied with backpack sprayers and/or a truck-hose/handgun.

### 2.1.4 Fall Inspection – 2006 NTCRA

The fall inspection of the bypass pipeline including the inlet and outlet structures, sedimentation basin and infiltration basin, and run-on control channel was performed by Len Mason (Formation) on November 4, 2019. Weather conditions were sunny; however, the ground was snow covered.

Inspection of the pipeline alignment, including access points and vents, found that it was in good condition (Appendix A). The access road was snow covered, but no areas of erosion or areas requiring maintenance or repair were noted. Additionally, no areas of settlement or saturation were observed that would be indicative of pipeline leakage.

The bypass pipeline inlet structure was partially snow covered, but areas without snow were found to be in good condition. The concrete was stable, and no cracks were visible. Water was flowing evenly over the weir notches. The channel upstream of the inlet to the bypass pipeline was snow covered and riprap in the channel could not be observed. Inspection of the outlet structure found that it was in good condition with no maintenance or repair required.

The sedimentation basin, spillway, and infiltration basin were in good condition. Water present in the sedimentation basin was frozen. The spillway contained no sediment and there was no displacement of any of the riprap due to high-energy flow events. The infiltration basin was snow covered but no standing water, depressions, or sinkholes were evident. Rock placed around the upstream edge of the flume (UP-IN) appeared to be stable.

Inspection of the pipeline outlet dissipation structure, discharge weir, and staff gage found that they were generally in good condition. The concrete was stable and free of cracks. No sediment was present in the invert. The steel discharge weir was in good condition but appeared to be bowed outward as has been noted in previous inspections.

Inspection of the run-on control channel found that it was in good condition. Many areas of the run-on control channel and the sedimentation basin were snow covered, but no water was evident within any portion of the run-on control channel. Vegetation growth along the embankments of the channel was considered acceptable. Minimal erosion was observed at the outfall and in the dissipation basin.

### 2.1.5 Fall Inspection – 2013 NTCRA

The fall inspection of the cover system, access roads, drainage control features, sedimentation basins, and reclaimed borrow area for the 2013 NTCRA was performed by Jeff Hamilton (Simplot) and Art Burbank (USFS) on November 14, 2019. Weather conditions during the fall inspection were sunny and the ground was generally free of snow cover, with the exception of the west-side cover area. The objective of the fall inspection was to revisit and inspect areas where repairs were made earlier in the year as well as to identify any outstanding issues.

The inspection found the repaired items in overall good condition and the 2013 NTCRA components performing as designed (Appendix A). The following items were identified as requiring additional repair:

- Pooled water was observed on top of the east-side cover area and minor regrading is required to promote drainage. The area will be regraded in fall 2020.

- Additional wood straw mulch needs to be installed in the middle east-side slope to reduce erosion. Some wood straw mulch was installed following the inspection in fall 2019 and additional wood straw mulch will be installed in 2020.

### 2.1.6 Informal Inspections

Simplot and Formation personnel visited the pipeline inlet/outlet structures at various times in 2019 during routine surface water and groundwater sampling and when data were downloaded from data loggers installed at the flumes, weirs, and/or groundwater monitoring wells. Informal inspections of NTCRA components during these visits typically involved visual observations to assess the performance of the components relative to the design and occasionally involved minor “housekeeping” or maintenance activities.

## 2.2 Pipeline Flow Evaluation

The bypass pipeline captures streamflow from approximately 615 acres of the upper Pole Canyon Creek watershed and discharges it downgradient of the ODA (Figure 1-2). The flow through the bypass pipeline is measured continuously at both the inlet (UP-PD) and the outlet (LP-PD) using permanent weirs outfitted with pressure transducers and data loggers. Telemetry equipment installed at both the inlet and outlet, which allows transmission of continuous flow data throughout the year even when the inlet and/or outlet locations are inaccessible. The inlet telemetry system developed technical issues in late 2019 and stopped transmitting transducer data. Simplot has tried to rectify these issues but has not been successful and troubleshooting is ongoing. Details on the measurement methods at the pipeline inlet and outlet are provided in Appendix B.

A comparison of flow rates measured at these two locations is shown in Figure 2-1. Figure 2-1 also shows the 2019 cumulative flows for UP-PD and LP-PD and the relative percent differences between their cumulative flows. Only a limited amount of UP-PD pipeline flow data is available for 2019. A review of telemetry data indicated that the inlet transducer began icing up and recording erroneous data in November 2019. Ice build-up damaged the transducer and flow data is not available for UP-PD until the transducer was replaced on July 16, 2019. However, manual stage readings at UP-PD and LP-PD collected on May 21 confirmed that flow at the pipeline inlet and outlet were equal.

The 2019 peak flow rate for LP-PD was measured at approximately 4.3 cfs on May 17, 2019. A second peak observed at LP-PD was measured at 4.2 cfs on May 31, 2019. Flow data for this date is not available at UP-PD; however, a flow rate of 2.5 cfs was manually measured at UP-PD on May 21, 2019. Approximately 503 acre-feet of water passed through the bypass pipeline, with approximately 84 percent of the total 2019 discharge occurring before the inlet transducer was replaced. A comparison of cumulative flow volume (for the period where data is available for both stations) shows a small difference of about -1 percent at the end of 2019. This is within the measurement error and there is therefore no indication of leakage from the pipeline.

The difference in estimated flows may be due to a combination of factors related to measurement. Historically, the greatest difference in flow appears to occur during high-flow conditions. Discharge at the pipeline outlet (LP-PD) appears to surge and back up behind the weir, potentially causing a slightly biased-high reading at LP-PD. However, due to the geometry of the combination weir at UP-PD, there may be a decrease in flow measurement precision during low flow conditions. A negative flow difference did not develop until flows were less than 0.2 cfs. Additionally, differences may also be a result of possible instrument drift at UP-PD and/or LP-PD. Manual flow measurements are periodically collected to check the transducer readings and correct for instrument drift. Evaluation of flow monitoring data is ongoing, with possible correction of flow measurements based on new information.

# 3.0 MONITORING ACTIVITIES AND RESULTS

Effectiveness monitoring for the NTCRAs is conducted in accordance with *Pole Canyon Non-Time-Critical Removal Action Effectiveness Monitoring Plan Revision No. 5* (EMP Rev 5; Formation 2018). The specific objectives of the effectiveness monitoring program are to assess the overall effectiveness of the 2006 and 2013 NTCRAs in reducing the rate of selenium transport from the Pole Canyon ODA to surface water in Pole Canyon Creek and downstream in Sage Creek, to shallow alluvial groundwater underlying the ODA and to deeper Wells Formation groundwater, and in reducing or eliminating risks due to ingestion of vegetation by reducing selenium concentrations in vegetation growing on the ODA cover system. Effectiveness monitoring includes meteorological, surface water, and groundwater monitoring. Vegetation monitoring was conducted in 2018 and the results indicated that additional monitoring was not needed in 2019 (Formation 2019). Field activities are described for each monitoring type followed by a summary of the monitoring results.

## 3.1 Meteorological Monitoring

Monthly meteorological monitoring data were collected at the Site as specified in EMP Rev 5 (Formation 2018). A description of the field activities that were conducted and the precipitation data obtained, including any deviations from the specifications in EMP Rev 5, is presented below. Although it was not a specific requirement of EMP Rev 5, daily temperature data were compiled for use in the Hydrologic Evaluation of Landfill Performance (HELP3) Model.

### 3.1.1 Precipitation

Monthly precipitation data for 2005 through 2019, average monthly, and average annual precipitation amounts for the last 15 years are summarized in Table 3-1. Annual precipitation amounts are provided for the period from December 1 of the previous year through November 30 to account for snow accumulation in the winter season. The cumulative precipitation for 2019 is plotted in Figure 3-1, as well as the maximum, minimum, and average annual cumulative precipitation from 2005 through 2019.

Precipitation recorded at Smoky Canyon Mine in 2019 was 25.01 inches, which is above the 15-year average of 23.51 inches. Annual precipitation totals in the previous 15 years ranged from a low of 15.67 inches in 2012, to a high of 30.62 inches in 2017. February and September were the wettest months of 2019, with over one-third of the total annual precipitation occurring between them. April, May, and July also had above-average precipitation. August and November were exceptionally dry with precipitation 0.86 and 1.33 inches below the 15-year monthly average, respectively. December, January, March, and October were also drier than normal.

### 3.1.2 Temperature

Daily temperature measurements collected at the Slug Creek Divide Snow Telemetry (SNOTEL) station were used in HELP3 modeling to assess infiltration through the Pole Canyon ODA cover. Figure 3-1 compares the average daily temperature for 2019 (December 1, 2018 through November 30, 2019) to long-term average daily maximum and minimum temperatures and long-term monthly average temperatures. The period for long-term calculations for the HELP3 model is 1989 through 2019.

Daily average temperatures are typically below freezing from November through March. In 2019, average daily temperatures were generally within the long-term average. There was a significant temperature drop at the end of October which was far below the long-term average. The maximum daily average, 68 degrees Fahrenheit (F), occurred July 23, 2019. The minimum daily average, 2 degrees F, occurred January 2, 2019.

## 3.2 Surface Water

Effectiveness monitoring activities were performed, and data were collected at the monitoring locations specified in EMP Rev 5 (Formation 2018) as follows:

- Continuous surface water flow monitoring at UP-IN, UP-PD, LP-1, and LP-PD
- Semiannual flow monitoring of surface water upstream and downstream of Pole Canyon Creek at NSV-5 and NSV-6
- Semiannual water-quality monitoring of surface water upstream and downstream of the NTCRAs at UP-IN, UP-PD, LP-PD, LP-1, NSV-5, and NSV-6
- Three times a year (spring, summer, and fall) flow and water-quality monitoring of surface water in lower Sage Creek upstream of Hoopes Spring at LSV-1.

Surface water effectiveness monitoring locations are shown on Figure 3-2 and sample dates are listed in Table 3-2. A description of the field activities that were conducted and the monitoring results obtained, including any deviations from the specifications in EMP Rev 5, is presented below. Methods for evaluating continuous flow measurements are provided in Appendix B. Electronic data files are included as Appendix C.

### 3.2.1 Field Activities

Surface water flow was measured at all seven monitoring locations in May 2019 to characterize high-flow conditions associated with spring runoff (Table 3-3). Flow was measured at LSV-1 in August 2019 to evaluate the surface water transport pathway in lower Sage Valley upstream of

Hoopes Spring. Flow was measured at five of the seven locations in November 2019 to characterize low-flow conditions. Frozen conditions at NSV-5 and NSV-6 prohibited flow measurements during the November sampling event. Flow measurements at stations LSV-1, NSV-5, and NSV-6 were made or attempted using the area-discharge method. Flows at the other locations were monitored on a continuous basis using Parshall flumes installed at monitoring stations UP-IN and LP-1, and weirs at the bypass pipeline inlet (UP-PD) and outlet (LP-PD). Details of the measurement methods are provided in Appendix B.

Surface water quality samples were collected at all seven monitoring locations specified in EMP Rev 5 (Formation 2018) in May and November 2019 (Table 3-2). Two of these locations (UP-PD, UP-IN) are upstream of the Pole Canyon ODA and track the volume and quality of creek water entering the bypass pipeline and the infiltration basin. North Fork Sage Creek station NSV-5 is upstream of the confluence with Pole Canyon Creek. The other four stations, located downstream of the Pole Canyon ODA, include seepage from the downstream ODA toe at LP-1, lower Pole Canyon Creek station LP-PD, North Fork Sage Creek station NSV-6, and lower Sage Creek upstream of Hoopes Spring at station LSV-1. The 2019 surface water quality data are discussed separately for spring high-flow and fall low-flow conditions.

### 3.2.2 Surface Water Flow

Surface water flow measurements for spring and fall 2019 are provided in Table 3-3 and are discussed for Pole Canyon Creek, North Fork Sage Creek, and lower Sage Creek.

<u>Pole Canyon Creek</u>

Surface water flow measurements are automatically recorded through the use of pressure transducers equipped with data loggers at four locations within the Pole Canyon Creek drainage (from upstream to downstream): UP-PD, UP-IN, LP-1, and LP-PD (Figure 3-2). A discussion regarding pipeline flow, as measured at the inlet (UP-PD) and outlet (LP-PD), is provided in Section 2.2.

Flow rate and annual cumulative flow hydrographs for UP-IN (upstream of the infiltration basin) are shown in Figure 3-3. Runoff from approximately 210 acres of the upper Pole Canyon Creek watershed (Figure 1-2), as well as two small Dinwoody Formation springs located immediately upstream of the flume at UP-IN, contribute to flow at this monitoring location.

The cumulative flow hydrograph provided on Figure 3-3 shows the minimum and maximum annual cumulative flow recorded at UP-IN for the period of record from 2009 through 2018 as well as the cumulative flow for 2019. Flow at UP-IN was manually measured at 0.55 cfs in spring 2019 and estimated at less than 0.1 cfs in the fall. In 2019, approximately 123 acre-feet of water flowed through the UP-IN flume into the infiltration basin. The minimum (105 acre-feet) and maximum (432 acre-feet) annual cumulative flow volumes through the UP-IN flume occurred during 2013 and 2017, respectively. The peak flow rate recorded at the UP-IN flume in 2019 was 0.8 cfs, which is similar to previous peak flow rates, but much lower than the peak flow rate recorded in 2017 (3.6 cfs).

The flow rate and annual cumulative flow hydrographs for LP-1 (immediately downstream of the Pole Canyon ODA toe) are shown on Figure 3-4. The flow recorded at LP-1 represents seepage through the Pole Canyon ODA that is derived from incident precipitation on the surface of the ODA. Water from the Panel A storm water collection ditch no longer flows across the Pole Canyon ODA since implementation of the 2013 NTCRA and therefore does not contribute to flow at LP-1. The post-2013 NTCRA configuration of the run-on controls directs the relatively clean storm water from Panel A around the ODA material. In addition, clean storm water is also directed off the cover to several sedimentation basins (Figure 1-3).

The cumulative flow hydrographs provided on Figure 3-4 show the minimum and maximum annual cumulative flow recorded at LP-1 for the period of record from 2009 through 2018 as well as the cumulative flow for 2019. Flow at LP-1 was manually measured at 0.02 cfs during spring 2019 and 0.005 cfs in the fall. Cumulative flow for LP-1 during 2019 was estimated at 8.8 acre-feet. The maximum cumulative flow at LP-1 was recorded in 2014 (28 acre-feet); the minimum cumulative flow was recorded in 2013 (2 acre-feet), which was a drier than normal year. The peak flow rate recorded at LP-1 in 2019 was 0.15 cfs.

Immediately downstream from the toe of the ODA, the flow observed at LP-1 infiltrates into underlying alluvial deposits and possibly the Wells Formation aquifer. During the spring 2019 sampling event, seep water from the ODA toe seep was observed to infiltrate within a short distance downstream of LP-1. The stream channel remained dry all the way to the bypass pipeline outlet at LP-PD. Flow from the pipeline did not reach northern Sage Valley or North Fork Sage Creek. These observations are consistent with observations made in previous years.

<u>North Fork Sage Creek and Lower Sage Creek</u>

Manual flow measurements are targeted in the spring and fall along North Fork Sage Creek (NSV-5 and NSV-6) and in the summer, spring and fall at lower Sage Creek (LSV-1) (Table 3-3). Station NSV-5, located along North Fork Sage Creek upstream of the confluence with Pole Canyon Creek, has dense vegetation and shallow flow. Flow measured at NSV-5 in May 2019 was 0.8 cfs. Downstream at NSV-6, flow was measured at 5.3 cfs in May. This increase in flow is a result of near surface and diffuse flow associated with water from Pole Canyon Creek. Flow was not measured at NSV-5 or NSV-6 in November due to frozen conditions. Station LSV-1 is located farther downstream below the confluence with Sage Creek. During 2019, LSV-1 flow was measured at 21.6 cfs in May, 6.1 cfs in August, and 3.3 cfs in November.

### 3.2.3 Surface Water Quality

Selenium concentrations in surface water samples collected in 2019 are reported in Table 3-4 and discussed separately by sampling event. Total selenium concentrations are shown on Figure

3-5. For comparison, the State of Idaho aquatic life criterion for selenium (surface water quality standard) (Idaho Administrative Procedures Act [IDAPA] 58.01.02) is 0.0031 milligrams per liter (mg/L) at Pole Canyon Creek (LP-1 and LP-PD) and North Fork Sage Creek (NSV-5 and NSV-6), and 0.0167 mg/L at Sage Creek (LSV-1).

Spring High-Flow Conditions

Surface water samples were collected in May along Pole Canyon Creek downstream of the Pole Canyon ODA at LP-1 and LP-PD. Total selenium was detected at LP-PD at a concentration of 0.0004 mg/L. The concentration of total selenium at LP-1 was 4.69 mg/L.

In May 2019, during the high-flow period, surface water samples were collected from North Fork Sage Creek upstream and downstream of the confluence with Pole Canyon Creek (NSV-5 and NSV-6, respectively) and from Sage Creek downstream of the confluence with North Fork Sage Creek (LSV-1). The total selenium concentration at NSV-5 was 0.0002 mg/L and farther downstream at NSV-6 the concentration was higher at 0.0053 mg/L. Downstream of the confluence of Sage Creek and North Fork Sage Creek at LSV-1, the total selenium concentration in May was 0.0013 mg/L. The concentration at NSV-6 was above the water quality standard while the concentrations at NSV-5 and LSV-1 were below the respective water quality standards for those stream reaches.

Fall Low-Flow Conditions

Surface water samples were collected in November downstream of the Pole Canyon ODA at LP-1 and LP-PD. Total selenium was not detected at LP-PD. The concentration of total selenium at LP-1 was 2.31 mg/L. As shown on Figure 3-5, this is the lowest concentration measured since the bypass pipeline became operational. All of the total selenium concentrations at LP-1 exceeded the water quality standard; however, concentrations appear to be generally decreasing since completion of the Dinwoody/Chert cover system for the 2013 NTCRA in late 2015.

In November 2019 during the low-flow period, surface water samples were collected from North Fork Sage Creek (NSV-5 and NSV-6) and Sage Creek (LSV-1). Total selenium was not detected at NSV-5. Selenium was detected in surface water from NSV-6 at 0.0004 mg/L. Farther downstream at LSV-1, the total selenium concentration was measured at 0.0005 mg/L. All of these concentrations were below the water quality standard.

Mass Loading Evaluation

Selenium loading was evaluated using selenium concentrations and corresponding flow measurements for monitoring conducted in May 2019 (Figure 3-6). At the ODA toe seep (LP-1), the selenium mass load was estimated at 0.51 pounds per day (lbs/day), which is the lowest estimated LP-1 load during the May sampling period since completion of the 2006 NTCRA.

Seep discharges at LP-1 typically infiltrate to the underlying alluvial groundwater upgradient of the bypass pipeline discharge at LP-PD and this was the case in 2019.

The mass load at NSV-5, which is located upstream of the confluence with Pole Canyon Creek, was 0.001 lbs/day. Flow can be difficult to accurately measure at NSV-5 due to the presence of significant vegetation on both banks, and also because the reach is often ponded or, at best, is very shallow and meandering at a very low velocity.

The selenium mass load for NSV-6 and LSV-1 in May were both 0.15 lbs/day, indicating that there are no additional inputs of selenium between these two locations and that all selenium from Pole Canyon is present in North Fork Sage Creek at location NSV-6. This also indicates that the majority of the selenium load emanating from the Pole Canyon ODA is not transported to North Fork Sage Creek, but is either attenuated in Sage Valley or transported from the alluvial groundwater to the underlying Wells Formation groundwater which discharges to the surface at Hoopes Springs.

## 3.3 Groundwater

Effectiveness monitoring activities were performed, and data were collected at the locations specified in EMP Rev 5 (Formation 2018) as follows:

- Continuous groundwater level measurements at GW-15, GW-16, GW-22, and GW-26
- Semiannual water-quality monitoring of alluvial groundwater at wells GW-26, GW-15, and GW-22
- Semiannual water-quality monitoring of Wells Formation groundwater at well GW-16.

Groundwater monitoring locations are shown on Figure 3-2; sample dates are listed in Table 3-5. A description of the field activities that were conducted and the monitoring results obtained is presented below. There were no deviations from monitoring specifications in EMP Rev 5. Electronic data files are included as Appendix C.

### 3.3.1 Field Activities

Monitoring wells are equipped with pressure transducers and data loggers to obtain a continuous record of groundwater levels. Additionally, manual groundwater measurements are made at the time of sampling and are used to calibrate the transducer measurements.

Semiannual groundwater quality samples were collected at each monitoring location in May and November 2019 (Table 3-5). Monitoring wells GW-26, GW-15, and GW-22 monitor alluvial groundwater. Well GW-26 is located between the downstream toe of the Pole Canyon ODA and the outfall of the bypass pipeline, which discharges to the Pole Canyon Creek flow channel. Groundwater quality at GW-26 reflects conditions in the alluvium immediately downgradient of the ODA. Well GW-15 is located downgradient of the bypass pipeline outfall and reflects conditions in alluvial groundwater influenced by the discharge from the bypass pipeline. Well GW-22 monitors groundwater from two depths (90-100 feet, 148-150 feet) farther downgradient of the ODA in northern Sage Valley. Well GW-16 monitors groundwater quality in the Wells Formation immediately downgradient of the Pole Canyon ODA.

### 3.3.2 Groundwater Elevations

<u>Groundwater Elevations in Alluvium</u>

Alluvial groundwater elevation data for 2019 for monitoring wells GW-26, GW-15, and GW-22 are presented in Figure 3-7. Long-term groundwater elevations are presented in Figure 3-8.

Monitoring well GW-26 is located at the toe of the ODA, upgradient of GW-15. The groundwater elevation in GW-26 is generally about 30 feet higher than the groundwater elevation in GW-15 and indicates a relatively steep hydraulic gradient within the alluvial deposits as they fan out from Pole Canyon into Sage Valley. Generally, groundwater elevations at GW-26 are highest during spring high-flow conditions (Figure 3-7 and Figure 3-8). Since construction of the 2013 NTCRA Dinwoody/Chert cover system, groundwater elevations in GW-26 have exhibited relatively rapid changes due to precipitation events as was observed multiple times during 2019 (Figure 3-7). The cover system has reduced infiltration into the ODA, resulting in increased runoff and infiltration into the alluvial aquifer downgradient of the ODA in the vicinity of GW-26.

During 2019, groundwater levels at GW-15 followed a similar trend to past years, decreasing during the winter (January through March) and rising in response to spring runoff, as shown on Figure 3-8. Water levels generally deceased in GW-15 from early June into November. Since the 2006 NTCRA was implemented in late 2007, water levels in the alluvial deposits below the Pole Canyon ODA, measured at GW-15, have fluctuated (Figure 3-8).

Well GW-22 monitors groundwater within the alluvial deposits in northern Sage Valley, downgradient of the alluvial deposits in lower Pole Canyon. The groundwater elevation at GW-22 is approximately 100 feet lower than the groundwater elevation at GW-15. Additionally, the hydrograph for alluvial groundwater at GW-22 is distinctly different than the hydrograph for alluvial groundwater at GW-15 (Figure 3-7 and Figure 3-8). Well GW-22 exhibits distinct seasonal fluctuations, but the hydrograph generally reflects gradual changes in water levels, rather than the smaller more frequent changes in water levels measured at GW-15 due to pipeline discharge. The annual low and high-water levels at GW-22 in 2019 exhibited relatively low peak-water levels, similar to years 2012 and 2016. There has been a generally decreasing trend in high-water levels at GW-22 since 2017, which was a wetter-than-normal year. This trend is similar to those following the 2011 and 2014 high-water years.

Groundwater Elevations in Wells Formation

Figure 3-9 presents the groundwater elevation data collected from 2003 through 2019 for Wells Formation monitoring well GW-16. Groundwater at GW-16 exhibits a seasonal pattern of rapidly increasing water levels in late-spring and early-summer (starting in April and peaking in July or August) and gradually declining water levels the rest of the year. Groundwater elevations at GW-16 typically fluctuate about 6 to 9 feet annually. In 2011 and 2017, which were wetter-than-normal years, groundwater elevations fluctuated about 15 to 17 feet, respectively. In 2019, GW-16 groundwater elevations fluctuated about 4 feet, which is similar to historical fluctuations. Although water levels have shown a decreasing trend since the high-water year in 2017, groundwater elevations remained slightly higher than normal in 2019.

### 3.3.3 Groundwater Quality

Selenium concentrations in groundwater samples collected in 2019 are reported in Table 3-6 and discussed separately for alluvial groundwater and for groundwater in the Wells Formation aquifer. For comparison, the primary constituent standard for selenium in groundwater under the State of Idaho Ground Water Quality Rule (IDAPA 58.01.11) is 0.05 mg/L.

Groundwater Quality in Alluvium

Alluvial groundwater quality is monitored at three locations downgradient of the Pole Canyon ODA (Figure 3-2) to track groundwater quality along the alluvial groundwater flow path from the Pole Canyon ODA to Sage Valley. From upgradient to downgradient, these monitoring wells are GW-26, GW-15 and GW-22. Well GW-26, located at the toe of the ODA near surface water monitoring station LP-1, was first sampled in March 2009. Well GW-15, located farther downgradient in lower Pole Canyon below the pipeline outlet has been sampled since fall 2003. Well GW-22, which is installed in the thick alluvial deposits within northern Sage Valley downgradient of Pole Canyon, has been sampled since fall 2004. Figure 3-10 presents the total selenium concentrations measured in groundwater samples collected from these wells through 2019.

Alluvial groundwater monitoring well GW-26 demonstrates alluvial groundwater conditions immediately downgradient of the Pole Canyon ODA. The total selenium concentration in alluvial groundwater collected from GW-26 in spring and fall were above the groundwater quality standard at 1.85 and 1.59 mg/L, respectively (Figure 3-10). Since implementation of the 2013 NTCRA, selenium concentrations at GW-26 in the spring have significantly decreased (from a maximum concentration of 5.16 mg/L in May 2015). The decreasing concentration trend at GW-26 began in 2016, the first year after construction of the cover system. The reduced selenium concentrations (see Figure 3-7) appear to be the result of less infiltration through ODA overburden and increased runoff from the cover that infiltrates into the alluvial aquifer in the vicinity of GW-26.

Farther downgradient, and downstream of the bypass pipeline discharge at LP-PD, the total selenium concentration in GW-15 groundwater (Figure 3-10) was above the groundwater quality standard during spring (0.139 mg/L) and decreased in the fall (0.0322 mg/L) to below the standard. The lower selenium concentrations in alluvial groundwater at GW-15 as compared to GW-26 can be attributed to the effects of recharge to alluvial groundwater from clean creek water that is discharged from the bypass pipeline just upgradient of GW-15 and, to a lesser extent, to increased runoff from the ODA as a result of the cover and infiltration of this water into the alluvial aquifer downgradient of the ODA. Selenium concentrations at GW-15 decreased significantly approximately one year following implementation of the 2013 NTCRA.

Monitoring well GW-22 is screened in valley-fill alluvial deposits in Sage Valley downgradient of Pole Canyon Creek. Samples were collected at GW-22 from two distinct depths: 90 to 100 feet and 148 to 150 feet. As shown in Figure 3-10, selenium concentrations vary with depth and over time. Groundwater collected from the shallower depth generally has higher selenium concentrations than the deeper alluvial groundwater. In 2019 the highest selenium concentration (0.1 mg/L) was detected in the shallow interval in November, while the concentration was similar but slightly lower in May (0.0994 mg/L). The concentrations in the deeper interval showed a seasonal pattern similar to past years with a higher concentration detected in May (0.048 mg/L) and the lower concentration detected in November (0.0429 mg/L). Only the selenium concentrations in groundwater from the shallower interval exceeded the groundwater quality standard. Selenium concentrations at GW-22 have generally decreased since the 2013 NTCRA was completed.

<u>Groundwater Quality in Wells Formation</u>

Monitoring well GW-16 provides groundwater quality data for the Wells Formation aquifer immediately downgradient from the Pole Canyon ODA (see Figure 3-2). Concentrations at GW-16 have decreased significantly following the completion of the 2013 NTCRA (Figure 3-10). Selenium concentrations reported for samples collected in May (0.47 mg/L) and November (0.476 mg/L) 2019 were the lowest concentrations measured since 2004 but remained above the groundwater quality standard.

# 4.0 EFFECTIVENESS EVALUATION

This section uses a combination of monitoring data, statistical analyses, and computer modeling to quantitatively evaluate the overall effectiveness of both of the NTCRAs in reducing selenium transport from the Pole Canyon ODA to groundwater and surface water. The approach for the 2019 evaluation is the same as that used in previous years.

## 4.1 Results of Statistical Analysis of Selenium Concentrations in Surface Water and Groundwater

A statistical evaluation of the pre- and post-NTCRA monitoring data was performed for key monitoring locations downstream and downgradient of the Pole Canyon ODA to evaluate the effectiveness of the NTCRAs in reducing selenium transport from the ODA to surface water and groundwater pathways in accordance with EMP Rev 5 (Formation 2018). The key monitoring locations specified in EMP Rev 5 are LP/LP-PD, NSV-6, and LSV-1 for surface water, GW-15 and GW-22 for alluvial groundwater, and GW-16 for Wells Formation groundwater. Pre-NTCRA data cover the period prior to implementation of the 2006 NTCRA (May 2000 through September 2007), and post-NTCRA data cover the period following implementation of the 2006 NTCRA (September 2007 through November 2019). These data sets, which have been split into two groups to represent seasonal effects, are used in the statistical analysis for this report.

The data, statistical methods, and results are presented in Appendix D. Results of the analysis of selenium concentrations at key effectiveness monitoring locations are:

- Statistically significant decreases in selenium concentrations since the 2006 NTCRA was implemented in surface water in lower Pole Canyon Creek at location LP/LP-PD.

- Statistically significant increases in selenium concentrations since the 2006 NTCRA was implemented in surface water in North Fork Sage Creek (NSV-6) for spring-summer. However, average selenium concentrations in spring-summer were much lower during the period between 2014 to 2019 (0.0046 mg/L), compared to the period between 2008 to 2013 (0.015 mg/L). Prior to operation of the 2006 NTCRA pipeline, the flow of Pole Canyon Creek delivered a relatively large mass of selenium to soils and sediments in Sage Valley. The reducing concentrations appear to indicate that this mass is gradually migrating out of the system and it is expected that concentrations will continue to decrease in the future. Selenium concentrations for fall-winter have displayed statistically significant decreases over time and the total selenium concentration in surface water at NSV-6 during fall-winter was below the surface water quality standard (0.0031 mg/L) during 2019.

- Statistically significant decreases in selenium concentrations since implementation of the 2006 NTCRA in surface water in Sage Creek (LSV-1) for both seasons. Selenium concentrations in both seasons were below the surface water quality standard (0.0167 mg/L) during 2019.

- Statistically significant decreases in selenium concentrations since implementation of the 2006 NTCRA in alluvial groundwater at GW-15 for both seasons. Total selenium concentration in groundwater at GW-15 during fall-winter was below the groundwater quality standard (0.05 mg/L) in 2019.

- Comparison of pre- and post-NTCRA data was not possible for GW-22 as the majority of the samples were collected after completion of the 2006 NTCRA; therefore, the statistical analysis for this location focused only on changes in concentration since completion of the 2006 NTCRA. For groundwater from both depths, additional data are needed to confirm an increasing trend in selenium concentrations at the 90 percent confidence level.

- Statistically significant increases in selenium concentrations since the 2006 NTCRA was implemented in Wells Formation groundwater downgradient of the Pole Canyon ODA (GW-16) for both seasons. However, total selenium concentrations were increasing prior to implementation of the 2006 NTCRA and remained relatively steady after construction was completed. Since implementation of the 2013 NTCRA, total selenium concentrations in groundwater have decreased at GW-16 (as shown on Figure 3-10) and the 2019 concentrations were the lowest measured since 2004.

## 4.2 Annual Water-Balance and Mass-Balance Comparison Results

The decision rules in EMP Rev 5 (Formation 2018) focus on evaluating effectiveness by identifying changes in selenium concentrations associated with both NTCRAs, along with consideration of selenium mass load changes. The water-balance and mass-balance models have been developed to quantify the reduction in selenium mass transport from pre-NTCRA to post-NTCRA conditions. The 2019 model inputs include detailed flow measurements, selenium concentration monitoring results, and local meteorological data. Model runs for 2019 were developed to represent the following scenarios:

- With NTCRAs – Actual conditions including both the 2006 and 2013 NTCRAs

- Without NTCRAs – Hypothetical conditions that would have existed if no actions had been implemented

The comparison of the estimated annual selenium mass transport from the ODA for each scenario serves as the basis for evaluating the overall effectiveness of the NTCRAs. Figure 4-1 illustrates the conceptual water-balance model developed for both the “with NTCRAs” and “without NTCRAs” scenarios and identifies each source of water inflow to the Pole Canyon ODA and each pathway for water outflow from the Pole Canyon ODA.

The results from the water-balance and mass-balance models, described in Appendix E, were used to compare the selenium load released over an entire “with NTCRAs” scenario year to the hypothetical “without NTCRAs” scenario year to determine the effectiveness of the NTCRAs.

### 4.2.1 Water-Balance Inflows

Results of the water-balance inflow calculations are presented and discussed in this section. Table 4-1 provides the water-balance inflow results for both scenarios. Assumptions and approaches for the calculations are described in Appendix E.

**Table 4-1: 2019 Pole Canyon ODA Water-Balance Model Inflow Summary**

| | **Without NTCRAs** | **With NTCRAs** | **Estimated Reduction** |
|---|---|---|---|
| ***Inflow*** | (acre-feet) | (acre-feet) | (percent) |
| Upper Pole Canyon Creek flow | 733 | 0 | 100% |
| Direct infiltration into ODA from surface | 51 | 16 | 68% |
| Run-on from upslope area due north of ODA | 54 | 0 | 100% |
| Run-on from Panel A storm water collection ditch | 50 | 0 | 100% |
| **Total** | **888** | **16** | **98%** |

#### 4.2.1.1 Upper Pole Canyon Creek Flow

The 2006 NTCRA eliminated the upper Pole Canyon Creek pathway to the Pole Canyon ODA. Therefore, the “with NTCRAs” scenario assumes the total Upper Pole Canyon Creek inflow is 0 acre-feet. For the “without NTCRAs” scenario, the estimated 2019 annual volume for this pathway was 733 acre-feet, which includes:

- 452 acre-feet of creek flow diverted through the bypass pipeline around the ODA and measured at the pipeline inlet (station UP-PD).
- 123 acre-feet of runoff generated above the infiltration basin measured at station UP-IN.
- 158 acre-feet of runoff reporting to the infiltration basin from the drainage between UP-IN and the infiltration basin (estimated using HELP3 model [Appendix E] for undisturbed ground over the year from December 1, 2018 through November 30, 2019).

#### 4.2.1.2 Direct Infiltration

The 2006 NTCRA had no effect on the amount of water that entered the ODA via direct infiltration, but the 2013 NTCRA entailed placement of the Dinwoody/Chert cover system in 2015. Based on the model assumptions (which are consistent with previous years to provide a comparable analysis) and 2019 inputs, direct infiltration into the Pole Canyon ODA was calculated at 1.6 inches for the “with NTCRAs” scenario in 2019, which equals 16 acre-feet over the 120-acre area.

For the "without NTCRAs" scenario, direct infiltration was calculated at 5.1 inches, which equals a total volume of 51 acre-feet.

#### 4.2.1.3 Run-On from Upslope Area Due North of the ODA

The 2006 NTCRA (i.e., "with NTCRAs") resulted in elimination of the potential run-on from the 95-acre area upslope/north of the ODA, with an annual 2019 volume of 0 acre-foot. The "without NTCRAs" scenario estimates a hypothetical annual 2019 volume of 54 acre-feet entering the Pole Canyon ODA via the upslope run-on pathway.

#### 4.2.1.4 Run-On from Panel A Storm Water Collection Ditch Crossing ODA

Based on construction of the 2013 NTCRA Dinwoody/Chert cover system in 2015, the "with NTCRAs" volume of Panel A storm water runoff annual 2019 volume was set at 0 acre-foot. The "without NTCRAs" scenario estimates a hypothetical annual 2019 volume of 50 acre-feet entering the Pole Canyon ODA via this pathway.

### 4.2.2 Water-Balance Outflows

Results of the water-balance outflow calculations are presented and discussed in this section. Table 4-2 presents a summary of the 2019 outflow results. The total annual outflow of water from the Pole Canyon ODA is equal to the total annual inflow. Water exits the ODA along three primary pathways:

- Surface water flow pathway, via lower Pole Canyon Creek
- Alluvial groundwater flow pathway
- Wells Formation groundwater flow pathway

The NTCRAs reduce the total annual inflow to the ODA and there is a corresponding reduction in the amount of water that flows out from the ODA along all three of these pathways.

Continuous flow occurred at the toe seep LP-1 in 2019. The total annual cumulative volume leaving the ODA in 2019 via the surface water pathway was estimated to be 8.8 acre-feet.

**Table 4-2: 2019 Pole Canyon ODA Water-Balance Model Outflow Summary**

| | **Without NTCRAs** | **With NTCRAs** | **Estimated Reduction** |
|---|---|---|---|
| ***Outflow*** | (acre-feet) | (acre-feet) | (percent) |
| Surface water discharge to lower Pole Canyon (measured at LP-1) | 494 | 8.8 | 98% |
| To alluvial groundwater | 65 | 1.4 | 98% |
| To Wells Formation groundwater | 329 | 5.9 | 98% |
| **Total** | **888** | **16.1** | **98%** |

The outflow volume for the surface water pathway was calculated using the transducer data discussed above, and the alluvial and Wells Formation outflows were estimated based on the water-balance assumptions as described in Appendix E.

### 4.2.3 Mass Balance Scenarios and NTCRA Effectiveness

The calculated annual selenium mass loads transported from the Pole Canyon ODA for the “with NTCRAs” and “without NTCRAs” scenarios during 2019 are provided in Table 4-3. The annual selenium load was calculated by multiplying the annual volume of water leaving the ODA (via each pathway) by the annual average selenium concentration in that type of water (i.e., surface water or groundwater). In the 2019 “without NTCRAs” scenario, the estimated selenium load was approximately 1,941 pounds (lbs). In the “with NTCRAs” scenario, the estimated selenium load was reduced to approximately 120 lbs resulting in an overall reduction in selenium mass transport of 94 percent. This is similar to the reductions estimated for the past 5 years. Table 4-4 provides a summary comparison of total selenium mass transport by year for the “with NTCRAs” and “without NTCRAs” scenarios.

Mass loads were also calculated for each outflow pathway using the annual outflow estimates presented in Table 4-3. For the 2019 “with NTCRAs” and “without NTCRAs” scenarios, selenium mass transport via discharge to lower Pole Canyon Creek was estimated to be reduced by approximately 92 percent, selenium transport to alluvial groundwater was estimated to be reduced by approximately 98 percent, and selenium transport to the Wells Formation was also estimated to be reduced by approximately 98 percent.

**Table 4-3: 2019 Pole Canyon ODA Mass-Balance Model Summary**

| | Without NTCRAs | With NTCRAs | Estimated Reduction |
|---|---|---|---|
| ***Annual Selenium Mass Transport*** | | | (percent) |
| Annual average selenium concentration in outflow surface water | 1.1 mg/L | 4.69 mg/L | --- |
| Annual average selenium concentration in seepage to groundwater | 0.43 mg/L | 0.43 mg/L | --- |
| To surface water in lower Pole Canyon Creek | 1478 lbs | 112 lbs | 92% |
| To alluvial groundwater | 76 lbs | 2 lbs | 98% |
| To Wells Formation groundwater | 386 lbs | 7 lbs | 98% |
| **Total** | **1,941 lbs** | **120 lbs** | **94%** |

Note: Because there was only one sample collected during spring 2019, a flow-weighted concentration was not calculated, and the annual concentration was set at 4.69 mg/L.

**Table 4-4: Estimated Annual Selenium Mass Transport, by Year, from the Pole Canyon ODA**

| Year | Without NTCRAs (lbs) | With NTCRAs (lbs) | Annual Load Reduction Due to NTCRAs (lbs) | Percent Reduction in Annual Selenium Mass Transport |
|---|---|---|---|---|
| 2008 | 1,570 | 170 | 1,400 | **89%** |
| 2009 | 2,200 | 230 | 1,970 | **90%** |
| 2010 | 1,470 | 80 | 1,390 | **95%** |
| 2011 | 5,980 | 1,250 | 4,730 | **79%** |
| 2012 | 1,630 | 210 | 1,420 | **87%** |
| 2013 | 1,220 | 140 | 1,080 | **89%** |
| 2014 | 2,060 | 470 | 1,590 | **77%** |
| 2015 | 1,450 | 190 | 1,260 | **87%** |
| 2016 | 1,840 | 190 | 1,650 | **90%** |
| 2017 | 4,140 | 233 | 3,907 | **94%** |
| 2018 | 1,347 | 86 | 1,261 | **94%** |
| 2019 | 1,941 | 120 | 1820 | **94%** |

Note: Estimated 2019 loads were calculated using annual average selenium concentrations and total annual outflows (Table 4-2).

# 5.0 SUMMARY

This section provides a summary of the 2019 effectiveness monitoring results as required by EMP Rev 5 (Formation 2018), and the 2019 performance evaluation as required by the 2006 NTCRA PRSC Plan (NewFields 2009) and 2013 NTCRA PRSC Plan (Formation 2016). The 2019 effectiveness evaluation includes a statistical evaluation of changes in selenium concentrations in surface water and groundwater, and comparisons of water-balance and mass-balance calculations for the "with NTCRAs" and "without NTCRAs" scenarios.

## 5.1 Performance Evaluation

The 2006 NTCRA components (bypass pipeline, sedimentation basin, infiltration basin, and run-on control channel) and 2013 NTCRA components (Dinwoody/Chert cover system, access roads, drainage control features, sedimentation basins, and reclaimed borrow area) were inspected and the various components were observed to be in good condition. Maintenance and repair activities performed in 2019 included addressing areas of erosion, seeding, repairing erosion control structures, removing sediment from sedimentation basins, and spraying for noxious weeds.

A flow evaluation was conducted of the bypass pipeline using continuous flow data collected at the pipeline inlet (UP-PD) and pipeline outlet (LP-PD). Only a limited amount of flow data was available for the pipeline inlet in 2019. A comparison of cumulative flow volume (for the period of overlapping data) showed a small difference of about 1 percent at the end of 2019; however, nearly 84 percent of the total flow through the pipeline had occurred by the time the inlet transducer was replaced and recording accurate data. The inflow estimate was slightly higher than the outflow estimate but was within the measurement error, and therefore, there is no indication of leakage from the pipeline.

## 5.2 Effectiveness Evaluation

Data collected at surface water (UP-PD, UP-IN, LP-1, LP-PD, NSV-5, NSV-6, LSV-1), alluvial groundwater (GW-26, GW-15, GW-22), and Wells Formation groundwater (GW-16) effectiveness monitoring locations are summarized as follows:

- Selenium was not detected or detected at relatively low concentrations at UP-PD, UP-IN, and LP-PD.
- Selenium concentrations at LP-1 (4.69 mg/L in spring; 2.31 mg/L in fall) exceeded the surface water quality standard. Concentrations have decreased since completion of the 2013 NTCRA, and the fall 2019 concentration was the lowest measured since the bypass pipeline became operational. Additionally, the estimated May 2019 load from LP-1 was the lowest estimated spring load since completion of the 2006 NTCRA. Water discharging

from LP-1 infiltrates into the alluvium and all surface water flow was lost upgradient of the bypass pipeline outlet (LP-PD).

- With the exception of the spring sample from NSV-6 (0.0053 mg/L), total selenium concentrations in surface water at NSV-5, NSV-6, and LSV-1 were below the surface water quality standard.

- Concentrations of total selenium in alluvial groundwater from GW-15 (0.139 mg/L) and GW-26 (1.85 mg/L) were above the groundwater quality standard but have generally decreased since completion of the 2013 NTCRA.

- Total selenium concentrations in the shallow interval of alluvial monitoring well GW-22 (0.1 mg/L) exceeded the groundwater quality standard while concentrations in the deep interval were below the standard. Concentrations for both depths have generally decreased since completion of the 2013 NTCRA.

- Concentrations of total selenium in Wells Formation groundwater from well GW-16 (0.47 mg/L) were above the groundwater quality standard. Selenium concentrations have decreased since completion of the 2013 NTCRA, and 2019 concentrations were the lowest measured since 2004, which was before the bypass pipeline was constructed.

### 5.2.1 Statistical Analysis of Selenium Concentrations

Results of the statistical analysis of selenium concentrations at key surface water (LP/LP-PD, NSV-6, LSV-1), alluvial groundwater (GW-15, GW-22), and Wells Formation groundwater (GW-16) monitoring locations are summarized as follows:

- Statistically significant decreases in selenium concentrations were confirmed at the 90 percent confidence level in surface water in lower Pole Canyon Creek (LP/LP-PD). The lower selenium concentrations can be attributed to a decrease in flow from LP-1 (water infiltrated into the subsurface before it reached LP/LP-PD) and to discharge of clean creek water from the bypass pipeline to lower Pole Canyon Creek.

- Statistically significant decreases in selenium concentrations were confirmed at the 90 percent confidence level downstream of the Pole Canyon ODA in surface water in North Fork Sage Creek (NSV-6) during fall-winter. Statistically significant increases in selenium concentrations were confirmed at the 90 percent confidence level during spring-summer. Prior to the operation of the 2006 NTCRA pipeline, the flow of Pole Canyon Creek delivered a relatively large mass of selenium to soils and sediments in Sage Valley. The reduction in concentrations appear to indicate that this mass is gradually migrating out of the system and it is expected that concentrations will continue to decrease in the future.

- Statistically significant decreases in selenium concentrations were confirmed at the 90 percent confidence level downstream of the Pole Canyon ODA in surface water in lower

Sage Valley (LSV-1) during both seasons. The lower selenium concentrations indicate that the majority of the selenium load emanating from the Pole Canyon ODA is either attenuated in Sage Valley or transported to alluvial groundwater and then to the underlying Wells Formation groundwater.

- Statistically significant decreases in selenium concentrations were confirmed at the 90 percent confidence level downgradient of the Pole Canyon ODA in alluvial groundwater (GW-15) for both seasons. The lower selenium concentrations can be attributed to the effects of recharge to alluvial groundwater from clean creek water that is discharged from the bypass pipeline.

- Comparison of pre- and post-NTCRA data was not possible for alluvial groundwater in northern Sage Valley (GW-22) as the majority of the samples were collected after completion of the 2006 NTCRA; additional data are needed to confirm trends in selenium concentrations at the 90 percent confidence level. Although GW-22 is located farther downgradient of the Pole Canyon ODA than GW-15, selenium concentrations have generally decreased since the 2013 NTCRA was completed.

- Statistically significant increases in selenium concentrations were confirmed at the 90 percent confidence level in Wells Formation groundwater downgradient of the Pole Canyon ODA (GW-16) for both seasons. Selenium concentrations were increasing prior to implementation of the 2006 NTCRA. Since implementation of the 2013 NTCRA, selenium concentrations in Wells Formation groundwater have decreased and 2019 concentrations were the lowest measured since 2004.

With the exception of spring concentrations at NSV-6, time-series plots show that post-2013 NTCRA selenium concentrations have decreased at all of the surface water and groundwater effectiveness monitoring locations used for the statistical analysis during both seasons.

### 5.2.2 Water-Balance and Mass-Balance Comparisons

The findings of the water-balance and mass-balance comparisons, using data collected for the effectiveness monitoring locations, are summarized as follows:

- Water-balance models estimate a 98 percent reduction in the annual inflow of water to the Pole Canyon ODA in 2019 as a result of the NTCRAs. Estimated reductions in the annual water inflow to the ODA resulted in equivalent reductions in the annual outflow from the ODA (98 percent).

- Monitoring data indicate an estimated annual reduction in selenium mass transport from the ODA of 1,820 pounds (94 percent) in 2019 as a result of the NTCRAs. The estimated load of selenium released from the ODA to the environment was 120 pounds in 2019.

## 6.0 REFERENCES

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United States Department of Agriculture, Forest Service Region 4, Idaho Department of Environmental Quality, Shoshone-Bannock Tribes (USFS, IDEQ, and Tribes). 2013. Administrative Settlement Agreement and Order on Consent/Consent Order for Non-Time-Critical Removal Action, Smoky Canyon Phosphate Mine. J.R. Simplot Company Respondent. Signed November 27, 2013.

**TABLES**

## Table 3-1
## Monthly Precipitation Totals for the Smoky Canyon Mine (2005–2019)

| Month | Monthly Precipitation (inches) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 15-Year Average (2005-2019) |
| December[1] | 1.64 | **4.31** | 1.94 | **2.18** | 2.02 | 1.52 | 2.73 | 0.97 | 2.74 | 1.83 | 1.77 | 1.39 | 3.31 | 1.63 | 1.63 | 2.11 |
| January | 2.08 | **4.18** | 0.85 | **2.72** | **2.85** | 1.99 | **2.61** | 2.24 | 1.63 | 2.11 | 1.01 | **3.33** | **4.89** | 2.09 | 1.91 | 2.43 |
| February | 1.40 | 1.41 | 1.50 | 1.86 | 1.99 | 0.97 | 1.73 | **2.25** | 0.99 | **4.72** | 0.96 | 1.54 | **5.5** | 2.08 | **4.33** | 2.22 |
| March | **2.16** | **2.07** | 1.19 | **2.38** | **2.56** | 0.86 | **3.32** | 1.10 | 1.84 | **2.34** | 0.79 | **2.56** | **2.46** | **2.80** | 1.13 | 1.97 |
| April | 1.38 | **2.37** | 1.89 | 1.31 | **2.54** | **3.36** | **4.24** | 2.22 | **2.47** | 1.57 | 1.74 | 2.00 | **3.09** | **2.58** | **2.66** | 2.36 |
| May | **4.13** | 1.02 | 0.47 | **2.60** | **2.56** | 1.91 | **3.14** | 1.77 | **2.61** | 0.93 | **5.40** | **3.64** | 1.89 | 2.21 | **3.23** | 2.50 |
| June | **3.24** | 0.91 | 0.77 | **2.33** | **6.31** | **2.89** | **2.09** | 0.11 | 0.09 | 1.60 | 1.38 | 1.01 | 1.12 | 1.39 | **1.82** | 1.80 |
| July | 0.52 | **0.90** | **1.51** | 0.02 | 0.57 | 0.26 | **1.92** | **0.96** | **2.00** | 0.63 | **1.63** | 0.27 | 0.15 | 0.24 | **0.9** | 0.83 |
| August | **1.52** | 1.22 | 1.09 | 0.67 | 1.11 | **1.78** | **2.20** | 0.04 | 1.12 | **5.06** | **1.45** | 0.64 | 1.36 | 1.27 | 0.54 | 1.40 |
| September | 1.31 | **2.14** | 1.50 | 1.69 | 0.29 | 0.50 | 0.36 | 0.42 | **2.92** | **4.34** | **2.68** | **4.82** | **3.13** | 0.18 | **4.62** | 2.06 |
| October | 1.39 | 1.67 | **3.00** | 0.66 | **2.25** | **2.79** | **2.66** | 1.67 | 1.84 | 0.91 | 0.53 | **5.79** | 0.75 | **2.43** | 1.65 | 2.00 |
| November | **2.58** | **3.02** | 1.03 | **2.66** | 0.21 | **2.79** | 1.85 | 1.92 | 1.34 | **2.86** | **2.25** | 1.12 | **2.97** | 1.67 | 0.59 | 1.92 |
| | | | | | | | | | | | | | | | | |
| **Total** | 23.35 | **25.22** | 16.74 | 21.08 | **25.26** | 21.62 | **28.85** | 15.67 | 21.59 | **28.90** | 21.59 | **28.11** | **30.62** | 20.57 | **25.01** | 23.51 |

**Notes:**

1. Annual precipitation calculated from December through November to account for snowfall accumulated in December of previous calendar year.
2. Precipitation amounts shown in bold are greater than the 15-year average precipitation total.

**Table 3-2**
**Surface Water Monitoring Locations and Sample Dates**

| Monitoring Locations | | 2019 Surface Water Quality Sampling and Flow Measurements | | | |
|---|---|---|---|---|---|
| **Location ID** | **Location Description** | **Winter (Jan-Feb-Mar)** | **Spring (Apr-May-Jun)** | **Summer (Jul-Aug-Sep)** | **Fall (Oct-Nov-Dec)** |
| ***Pole Canyon Creek*** | | | | | |
| UP-PD | Upper Pole Canyon Creek (Post Diversion) 100 feet upstream of diversion structure | - | 2019-05-21 | - | 2019-11-04 |
| UP-IN | Upper Pole Canyon Creek upstream of infiltration basin | - | 2019-05-21 | - | 2019-11-04 |
| LP-1 | Pole Canyon ODA toe seep | - | 2019-05-21 | - | 2019-11-04 |
| LP-PD | Lower Pole Canyon Creek (Post Diversion) at bypass pipeline dissipation structure | - | 2019-05-21 | - | 2019-11-04 |
| ***Northern Sage Valley*** | | | | | |
| NSV-5 | North Fork Sage Creek upstream of Pole Canyon Creek | - | 2019-05-21 | - | 2019-11-07 |
| NSV-6 | North Fork Sage Creek downstream of Pole Canyon Creek | - | 2019-05-21 | - | 2019-11-07 |
| ***Lower Sage Valley*** | | | | | |
| LSV-1 | Lower Sage Creek downstream of the confluence with North Fork Sage Creek and upstream of Hoopes Spring | - | 2019-05-21 | 2019-08-14 | 2019-11-06 |

**Notes:**

-- Sample collection not required.

# Table 3-3
# Manual Stream Flow Measurements

| Location ID | Stream Flow (cubic feet per second) | | | |
|---|---|---|---|---|
| | Winter (Jan-Feb-Mar) | Spring[1] (Apr-May-Jun) | Summer[2] (Jul-Aug-Sep) | Fall[3] (Oct-Nov-Dec) |
| ***Pole Canyon Creek*** | | | | |
| UP-PD[4] | -- | 2.51 | -- | 0.24[7] |
| UP-IN[5] | -- | 0.55 | -- | <0.1 |
| LP-1[6] | -- | 0.02 | -- | 0.005 |
| LP-PD[4] | -- | 2.55 | -- | 0.13 |
| ***Northern Sage Valley*** | | | | |
| NSV-5 | -- | 0.77 | -- | Not measured |
| NSV-6 | -- | 5.26 | -- | Not measured |
| ***Lower Sage Valley*** | | | | |
| LSV-1 | -- | 21.6 | 6.13 | 3.3 |

**Notes:**

1. Spring flow measurements were collected May 21, 2019.
2. Summer flow measurements collected August 14, 2019
3. Fall flow measurements were collected November 4-7, 2019. Flow measurements were not collected at NSV-5 and NSV-6 due to frozen water.
4. Continuous flow monitoring (see Figure 2-1)
5. Continuous flow monitoring (see Figure 3-3)
6. Continuous flow monitoring (see Figure 3-4)
7. Staff reading for UP-PD weir was likely high. Poor light conditions and shadows made it difficult to read staff plate.

-- Flow measurement not required.

## Table 3-4
## Surface Water Monitoring Results

| Location ID | Date | Field Parameters: Temperature (°C) | pH (S.U.) | Specific Conductivity (µmhos/cm) | Dissolved Oxygen (mg/L) | Turbidity (NTU) | Laboratory Parameters: Alkalinity, Total as $CaCO_3$ (mg/L) | Hardness, as $CaCO_3$ (mg/L) | Selenium, Dissolved (mg/L) | Selenium, Total (mg/L) | Sulfate (mg/L) | TDS (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State of Idaho Water Quality Criterion[1] | | NA | NA | NA | NA | NA | NA | NA | NA | ***<u>0.0031</u>*** | NA | NA |
| ***Pole Canyon Creek*** | | | | | | | | | | | | |
| UP-PD | 2019-05-21 | 4.4 | 8.14 | 357.2 | 9.6 | 2.28 | 185 | 184 | 0.0002 U | 0.0002 | 10.4 | 228 |
| | 2019-11-04 | 1.6 | 8.55 | 374.1 | 10.43 | 7.29 | 191 | 205 | 0.0002 U | 0.0002 | 13.9 | 253 |
| UP-IN | 2019-05-21 | 4.3 | 7.96 | 390.5 | 9.6 | 1.22 | 208 | 197 | 0.0002 | 0.0002 | 15.9 | 246 |
| | 2019-11-04 | 2.9 | 8.34 | 426.5 | 9.61 | 0.71 | 214 | 230 | 0.0002 | 0.0002 | 22.8 | 238 |
| LP-1 | 2019-05-21 | 12.5 | 7.06 | 293.7 | 7.53 | 70.1 | 351 | 1790 | 4.67 | ***<u>4.69</u>*** | 1720 | 2880 |
| | 2019-11-04 | 7.9 | 7.86 | 2973 | 8.53 | 1.76 | 351 | 2000 | 2.4 | ***<u>2.31</u>*** | 1690 | 2890 |
| LP-PD | 2019-05-21 | 5.1 | 8.35 | 355.9 | 9.7 | 2.51 | 189 | 188 | 0.0002 | 0.0004 | 9.9 | 224 |
| | 2019-11-04 | 4.5 | 8.78 | 355 | 10.15 | 2.46 | 175 | 195 | 0.0002 U | 0.0002 U | 14.3 | 220 |
| ***Northern Sage Valley*** | | | | | | | | | | | | |
| NSV-5 | 2019-05-21 | 11.9 | 7.71 | 187.2 | 7.3 | 4.1 | 94.3 | 86.1 | 0.0003 | 0.0002 | 3.07 | 123 |
| | 2019-11-07 | 0 | 7.83 | 358.6 | 10.6 | 3.09 | 198 | 208 | 0.0002 U | 0.0002 U | 23.2 | 279 |
| NSV-6 | 2019-05-21 | 11.3 | 7.96 | 372.6 | 7.73 | 6.68 | 191 | 197 | 0.0047 | ***<u>0.0053</u>*** | 12.3 | 275 |
| | 2019-11-07 | 0 | 7.87 | 498.1 | 11.29 | 2.32 | 306 | 315 | 0.0003 | 0.0004 | 26.7 | 344 |
| State of Idaho Water Quality Criterion[2] | | NA | NA | NA | NA | NA | NA | NA | NA | ***<u>0.0167</u>*** | NA | NA |
| ***Lower Sage Valley*** | | | | | | | | | | | | |
| LSV-1 | 2019-05-22 | 5.8 | 7.97 | 346.6 | 10.03 | 9.65 | 204 | 184 | 0.0012 | 0.0013 | 14.4 | 263 |
| | 2019-08-14 | 17.5 | 8.62 | 360.5 | 8.33 | 10.3 | 177 | 193 | 0.0006 | 0.0007 | 18.3 | 192 |
| | 2019-11-06 | 2.2 | 8.16 | 414 | 11.4 | 3.3 | 189 | 213 | 0.0006 | 0.0005 | 24.9 | 211 |

**Notes:**

Lab Qualifier: J - Estimated value; U - Not detected above the Method Detection Limit
°C - degrees Celsius
mg/L - milligrams per liter
µmhos/cm - micro mhos per centimeter
NTU - Nephelometric Turbidity Unit
S.U. - Standard units.
TDS - Total Dissolved Solids
NA - No State of Idaho Water Quality Criterion available.

1. State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02; chronic criteria). Site Specific Water Quality Criterion for Pole Canyon Creek and North Sage Creek
2. State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02; chronic criteria). Site Specific Water Quality Criterion for Sage Creek

***<u>0.0031</u>*** Bold, Italic, Underline - Concentration exceeds the State of Idaho Water Quality Standard.

**Table 3-5**
**Groundwater Monitoring Locations and Sample Dates**

| Monitoring Locations | | 2019 Groundwater Quality Sampling and Water Level Measurements | | | |
|---|---|---|---|---|---|
| **Location ID** | **Location Description** | **Winter (Jan-Feb-Mar)** | **Spring (Apr-May-Jun)** | **Summer (Jul-Aug-Sep)** | **Fall (Oct-Nov-Dec)** |
| ***Pole Canyon Creek*** | | | | | |
| *Alluvial Wells* | | | | | |
| GW-26 | Shallow alluvial well downgradient of Pole Canyon ODA upstream of bypass pipeline outlet | -- | 2019-05-22 | -- | 2019-11-05 |
| GW-15 | Shallow alluvial well downgradient of Pole Canyon ODA downstream of bypass pipeline outlet | -- | 2019-05-22 | -- | 2019-11-04 |
| *Wells Formation Bedrock Wells* | | | | | |
| GW-16 | Wells Formation bedrock well downgradient of Pole Canyon ODA and upgradient of bypass pipeline discharge | -- | 2019-05-22 | -- | 2019-11-04 |
| ***Northern Sage Valley*** | | | | | |
| *Alluvial Wells* | | | | | |
| GW-22 (98 FT) | Deep alluvial well near Lower Pole Canyon Creek on the western edge of Sage Valley | -- | 2019-05-22 | -- | 2019-11-04 |
| GW-22 (150 FT) | Deep alluvial well near Lower Pole Canyon Creek on the western edge of Sage Valley | -- | 2019-05-22 | -- | 2019-11-04 |

**Notes:**

-- Sample collection not required.

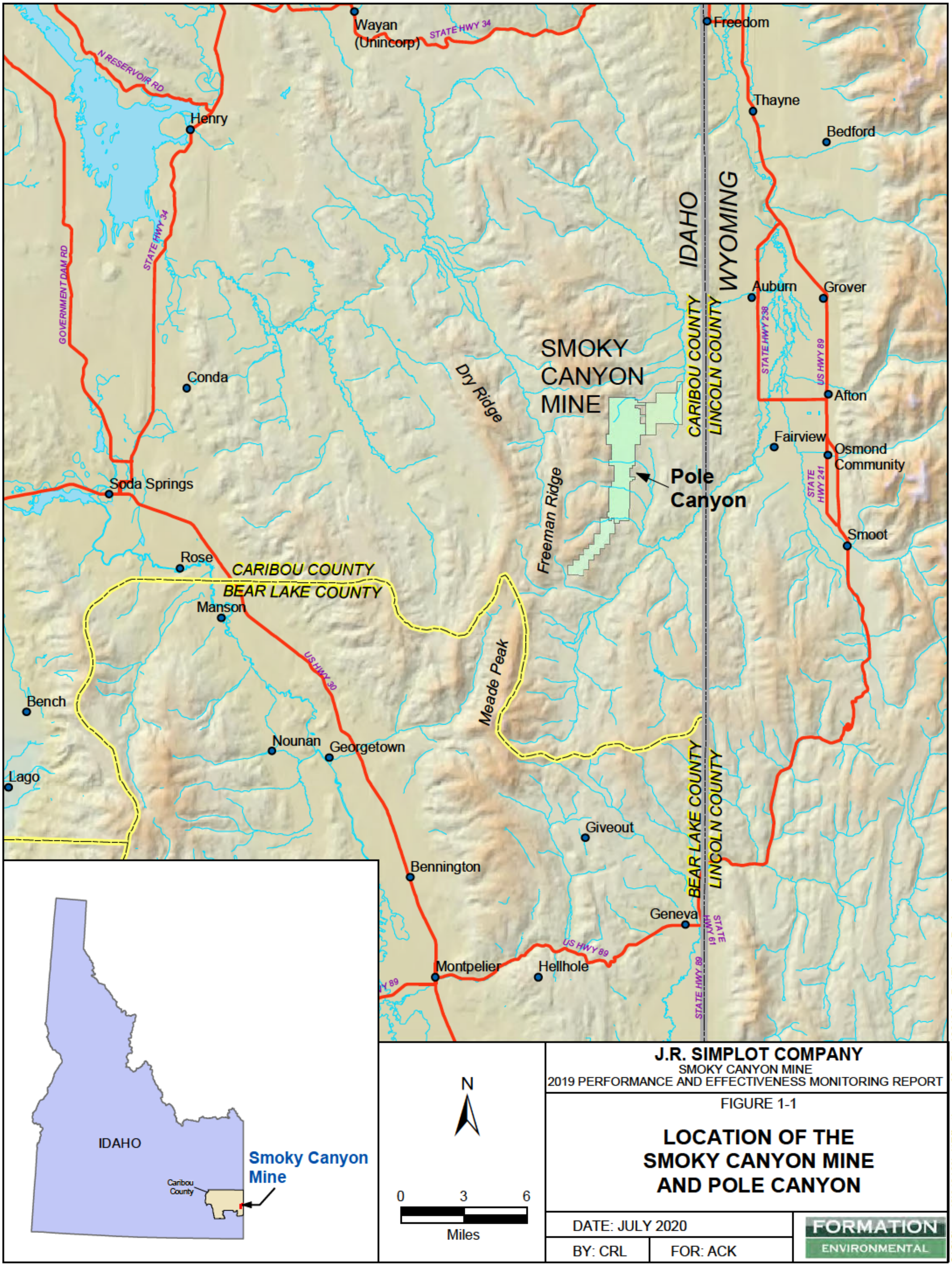
**Table 3-6**
**Groundwater Monitoring Results**

| Well ID | Date | Field Parameters | | | | | Laboratory Parameters | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Temperature (°C) | pH (S.U.) | Specific Conductivity (µmhos/cm) | Dissolved Oxygen (mg/L) | Turbidity (NTU) | Alkalinity Total as $CaCO_3$ (mg/L) | Selenium Dissolved (mg/L) | Selenium[1] Total (mg/L) | Sulfate[2] (mg/L) | TDS[2] (mg/L) |
| State of Idaho Ground Water Quality Standards | | NA | NA | NA | NA | NA | NA | NA | ***<u>0.05</u>*** | ***<u>250</u>*** | ***<u>500</u>*** |
| ***Pole Canyon Creek*** | | | | | | | | | | | |
| *Alluvial Wells* | | | | | | | | | | | |
| GW-26 | 2019-05-22 | 6.6 | 8.02 | 1667.7 | 7.55 | 1.41 | 229 | 1.72 | ***<u>1.85</u>*** | ***<u>743</u>*** | ***<u>1230</u>*** |
| | 2019-11-05 | 6.76 | 8.71 | 1633.6 | 6.48 | 0.68 | 231 | 1.45 | ***<u>1.59</u>*** | ***<u>636</u>*** | ***<u>1190</u>*** |
| GW-15 | 2019-05-22 | 6.24 | 8.33 | 482.4 | 8.03 | 1.19 | 181 | 0.124 | ***<u>0.139</u>*** | 64.9 | 196 |
| | 2019-11-04 | 8.99 | 8.83 | 404.8 | 6.44 | 0.55 | 196 | 0.0325 | 0.0322 | 22 | 232 |
| *Wells Formation Bedrock Wells* | | | | | | | | | | | |
| GW-16 | 2019-05-22 | 5.95 | 8.18 | 742.1 | 8.68 | 0.38 | 219 | 0.443 | ***<u>0.47</u>*** | 162 | 404 |
| | 2019-11-04 | 6.29 | 8.88 | 728.5 | 8.49 | 0.9 | 216 | 0.466 | ***<u>0.476</u>*** | 157 | 469 |
| ***Northern Sage Valley*** | | | | | | | | | | | |
| *Alluvial Wells* | | | | | | | | | | | |
| GW-22 (98 FT) | 2019-05-22 | 7.01 | 8.28 | 436.6 | 9.3 | 0.2 | 183 | 0.0958 | ***<u>0.0994</u>*** | 39.4 | 165 |
| | 2019-11-04 | 7.22 | 8.85 | 432.2 | 9.26 | 0.33 | 180 | 0.103 | ***<u>0.1</u>*** | 37.9 | 236 |
| GW-22 (150 FT) | 2019-05-22 | 6.88 | 8.24 | 397.4 | 8.66 | 0.44 | 179 | 0.0433 | 0.048 | 21.2 | 143 |
| | 2019-11-04 | 7.26 | 8.82 | 394.4 | 7.71 | 0.31 | 178 | 0.0436 | 0.0429 | 18.8 | 225 |

**Notes:**

Lab Qualifier: J - Estimated value; U - Not detected above the Method Detection Limit
°C - degrees Celsius
mg/L - milligrams per liter
µmhos/cm - micro mhos per centimeter
NTU - Nephelometric Turbidity Unit
S.U. - Standard units
TDS - Total Dissolved Solids
NA - No State of Idaho Ground Water Quality Standard available.
1. State of Idaho Ground Water Quality Rule (IDAPA 58.01.11), primary standards for drinking water .
2. Secondary standards for drinking water (non-enforceable guidelines based on aesthetic or cosmetic effects rather than health).
***<u>0.005</u>*** Bold, Italic, Underline - Concentration exceeds the State of Idaho Ground Water Quality Standard.

# FIGURES




J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 1-1

**LOCATION OF THE SMOKY CANYON MINE AND POLE CANYON**

DATE: JULY 2020

BY: CRL | FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010109\plt\EffectivenessMonPlan\2019AnnRpt\Fig1_1_RgnLoc.mxd

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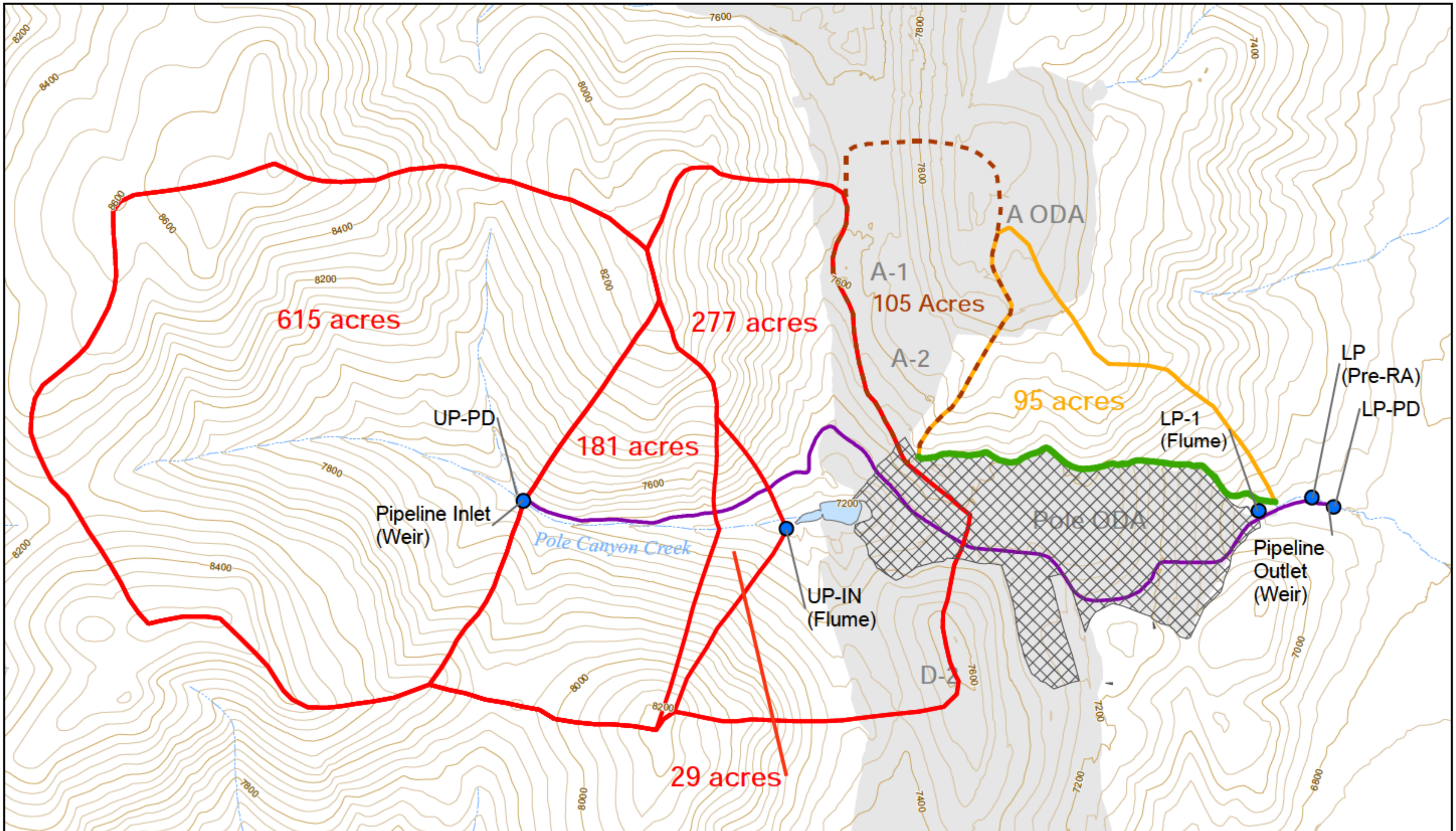



## Legend

- Flume and Weir Locations
- Drainage Area for Runoff from Panel A Reclaimed Area
- Pole Canyon ODA 2013 NTCRA Cover Area
- Upper Pole Canyon Creek Watershed
- Run-on Control Channel Watershed
- Bypass Pipeline (2006 NTCRA)
- Run-on Control Channel (2006 NTCRA)
- Sedimentation/Infiltration Basin (2006 NTCRA)
- Mine Disturbance Areas

NTCRA = Non-Time-Critical Removal Action

N

0 1,000 2,000
Feet

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

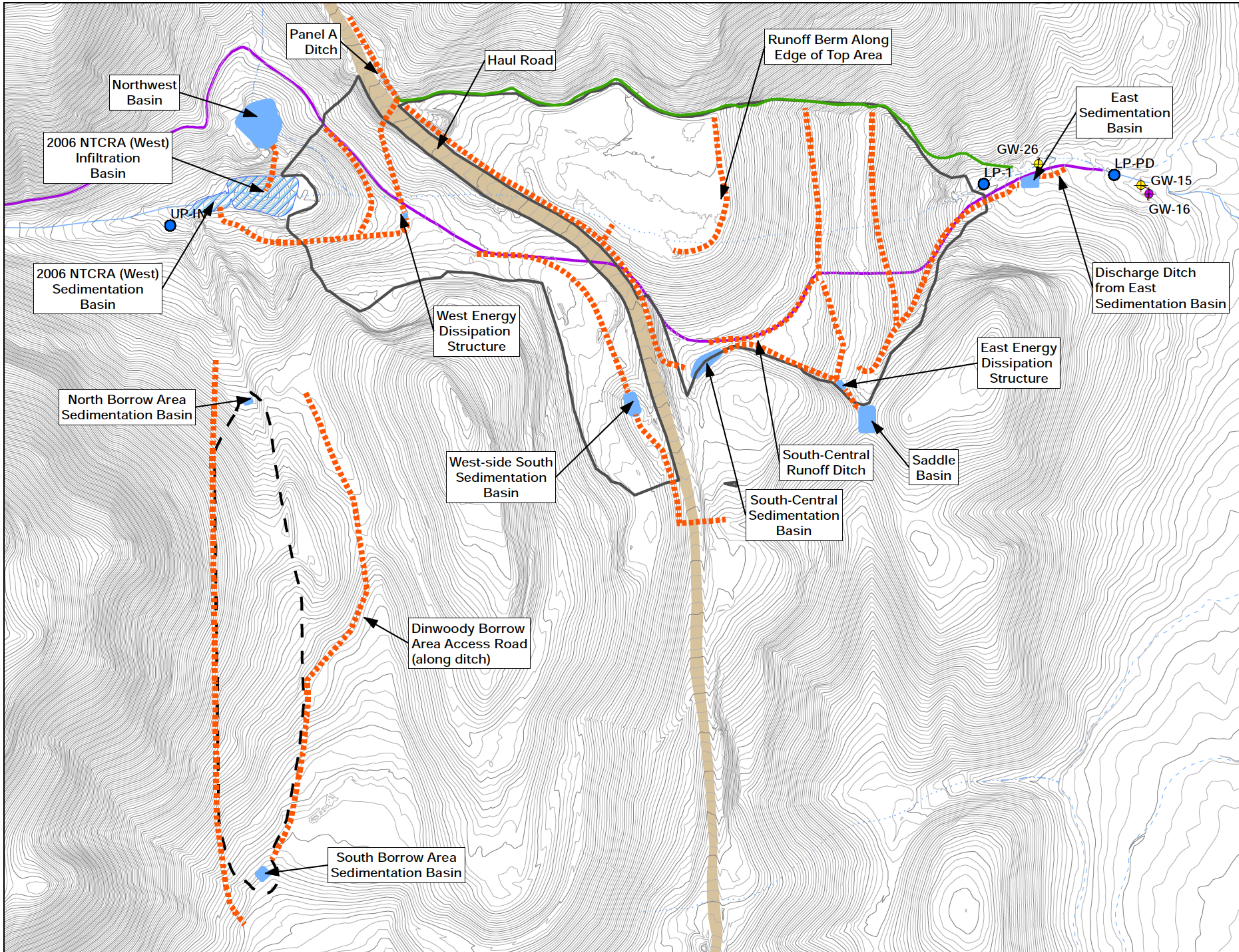
FIGURE 1-2

UPPER POLE CANYON CREEK WATERSHED AND 2006 NTCRA COMPONENTS

DATE: JULY 2020

BY: CRL | FOR: ACK

FORMATION ENVIRONMENTAL




## Legend

- Pre-ODA Creek Flow Path
- Irrigation Ditch
- Intermittent Stream
- Perennial Stream
- 2006 NTCRA Bypass Pipeline Alignment
- 2006 NTCRA Run-on Control Channel
- Approximate Stormwater Ditch Locations
- Haul Road
- Pole Canyon ODA Cover Area Boundary
- Dinwoody Borrow Area Boundary
- 2006 NTCRA Basin Footprints
- 2013 NTCRA Basin Footprints
- Alluvial Monitoring Well
- Wells Formation Monitoring Well
- Surface Water Monitoring Location

Note:
1. Topographic data are from 2016 as-built survey by Pierson Land Works (2013 NTCRA area) and 2013 aerial survey by Aerographics (other areas).

0 600 1,200
Feet

N

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 1-3

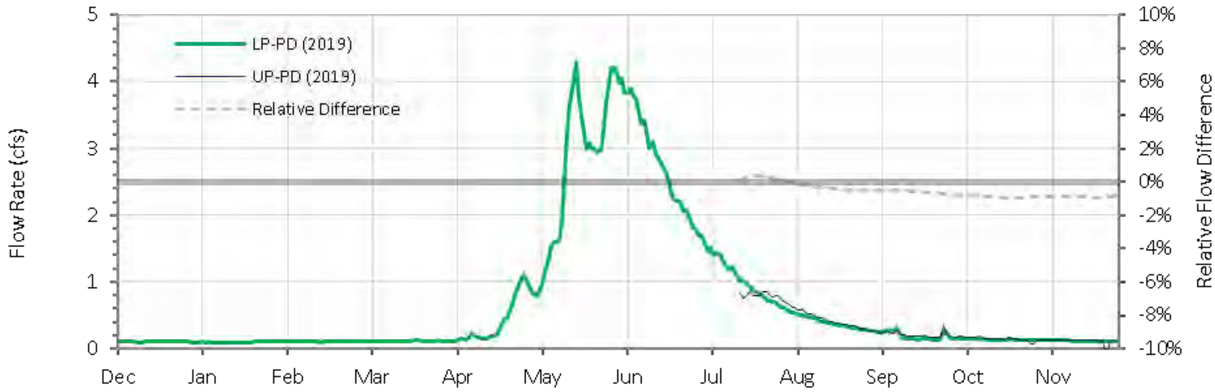
POLE CANYON
2006 NTCRA AND 2013
NTCRA COMPONENTS

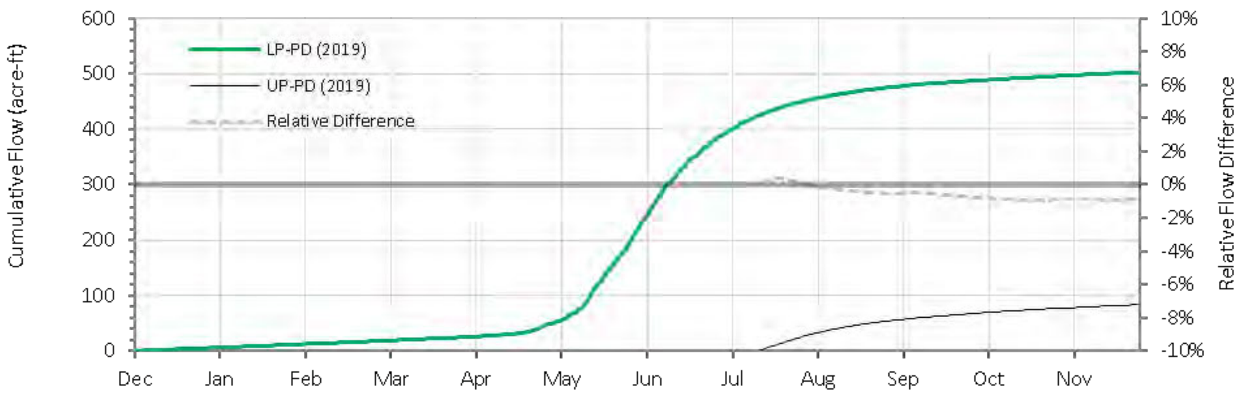
DATE: JULY 2020
BY: CRL | FOR: ACK

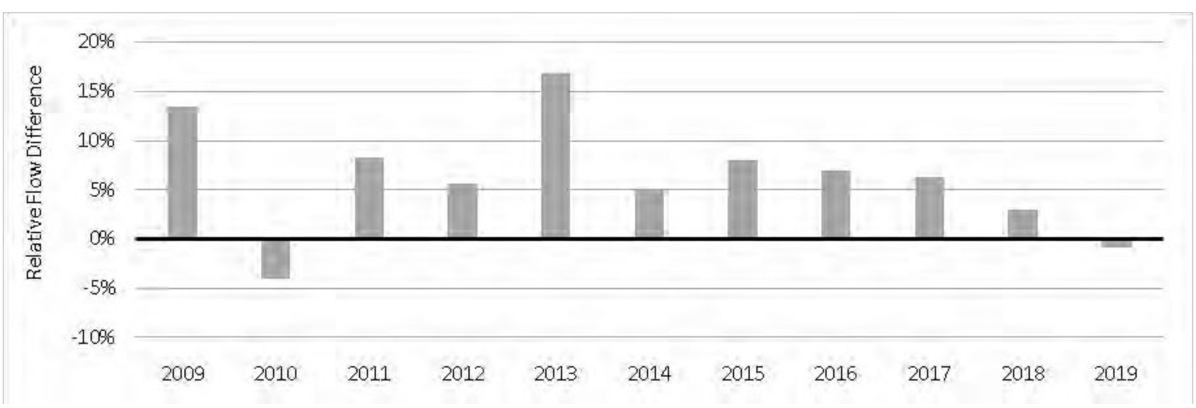
FORMATION ENVIRONMENTAL

S:\GIS\arcprj\2010109\plt\EffectivenessMonPlan\2019AnnRpt\Fig1_3_Pole_NTCRA_2016_2013.mxd

"S:\JOBS\SMOKY\CERCLA\POLENTCRA\ANNRPT\2019\DRAFT\FIGS\FIGSPORTRAIT_2019.PPTX"




Notes:

1. Relative flow difference is based on total volume discharged over the year, as measured at the LP-PD weir. A positive difference indicates more water was calculated discharging from the pipeline than entering at the inlet.
2. Flow data from the pipeline inlet (UP-PD) is unavailable from December 2018 unit July 16, 2019. The inlet transducer began icing up in early November 2018 and was damaged, resulting in the transducer recording erroneous data. The inlet transducer was replaced as conditions allowed on July 16.
3. Cumulative flow difference calculated for period when transducers at both LP-PD and UP-PD were operational (July 16, 2019 through November 30, 2019).

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2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 2-1

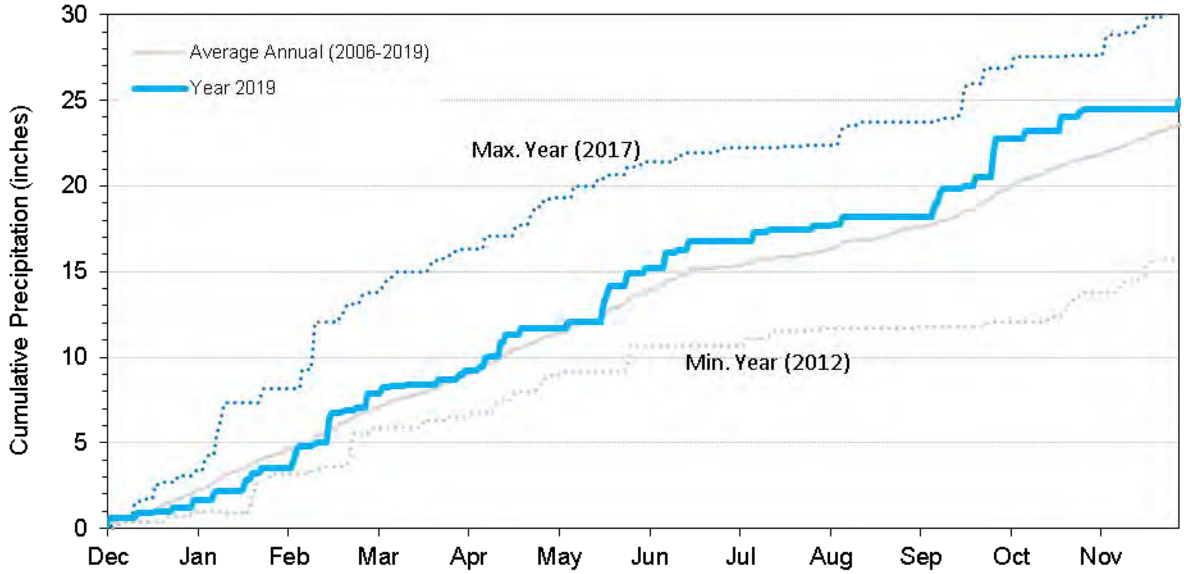
**BYPASS PIPELINE INFLOW/OUTFLOW COMPARISON**

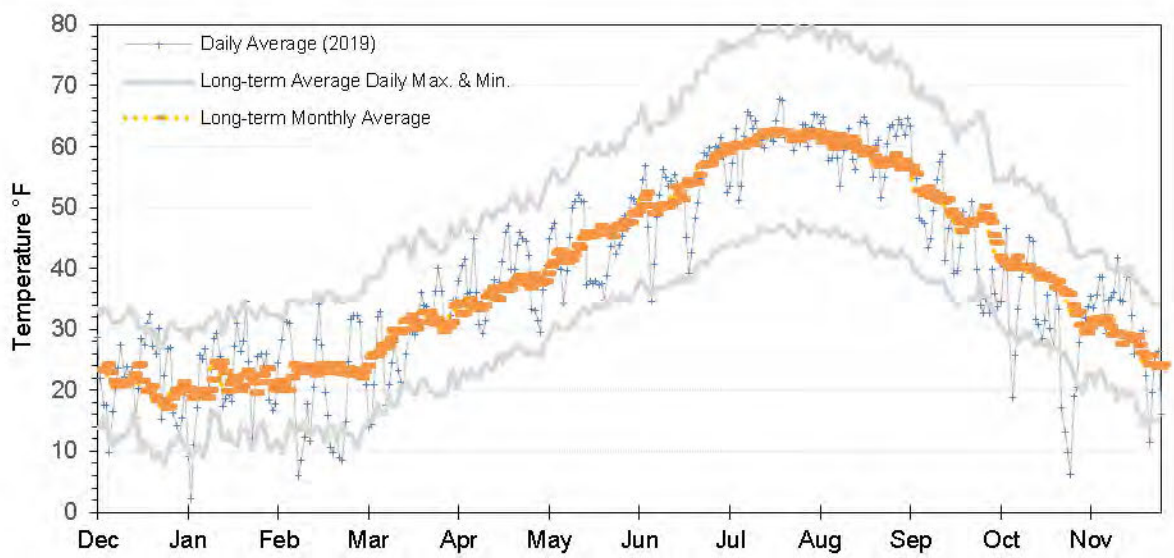
DATE: JULY 2020

BY: LJM | FOR: ACK

FORMATION ENVIRONMENTAL

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\tbl_DailyFlow_ALL_Pipeline_2019.xlsx"




Notes:

1. Precipitation data were collected at the Guard Shack through June 21, 2011.
2. Precipitation data from June 2011 to December 2013 were estimated from the Slug Creek Divide SNOTEL Station precipitation data and monthly manual measurements collected at the Guard Shack.
3. Manual precipitation data were collected at the Security Building from 2014 to present.
4. Long-term temperature data are from 1984-2019, Slug Creek SNOTEL.

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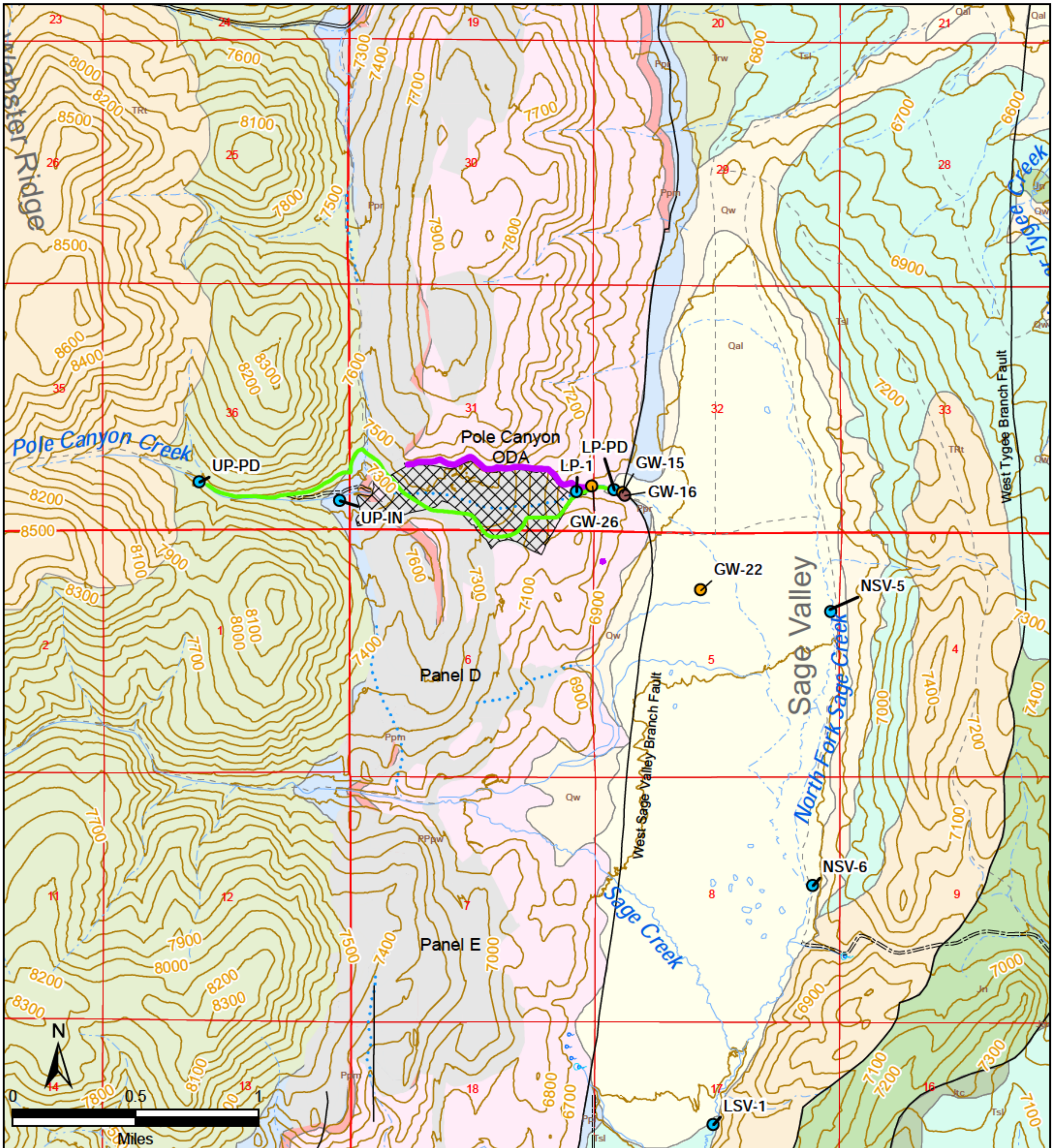
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-1

**CUMULATIVE PRECIPITATION AND TEMPERATURE AT SMOKY CANYON MINE**

| DATE: JULY 2020 | | FORMATION ENVIRONMENTAL |
|---|---|---|
| BY: LJM | FOR: ACK | |

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\MetDataSummary2019.xlsx"




Legend

- Alluvial Groundwater Sampling Location
- Wells Formation Groundwater Sampling Loca ion
- Surface Water Sampling Location
- Pole Canyon Creek Bypass Pipeline
- Run-on Control Channel
- Dinwoody/Chert Cover on Pole Canyon ODA (120 acres)
- Mine Disturbance Areas

Notes:
1. Mine disturbance area boundary includes a 50-foot buffer.
2. Topographic surface reflects 2015 conditions in mine disturbance areas.
3. Surface geology is from Mansfield (1927).

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-2

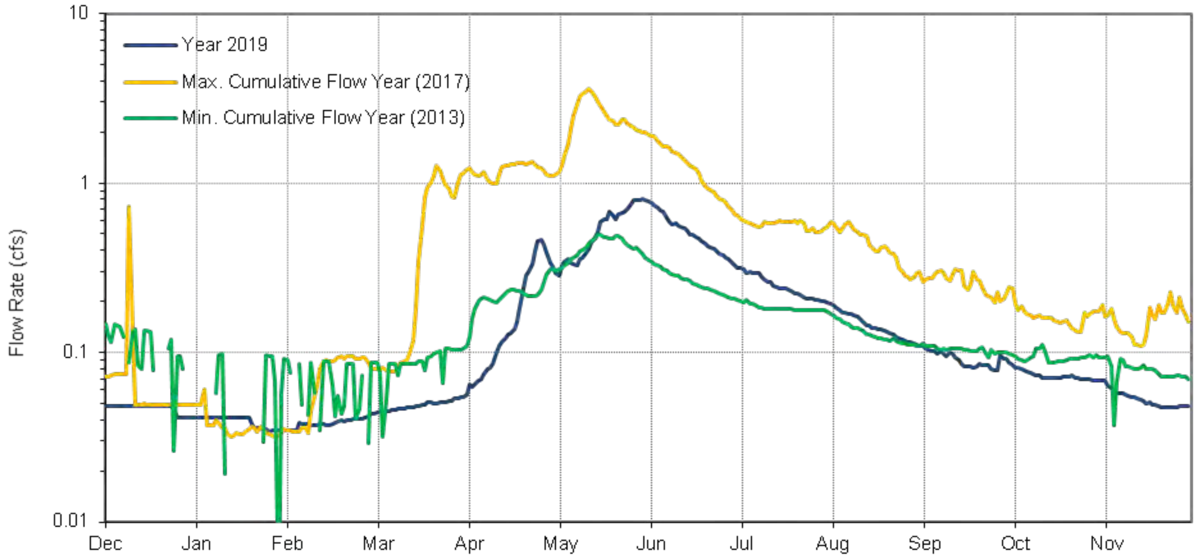
MONITORING LOCATIONS

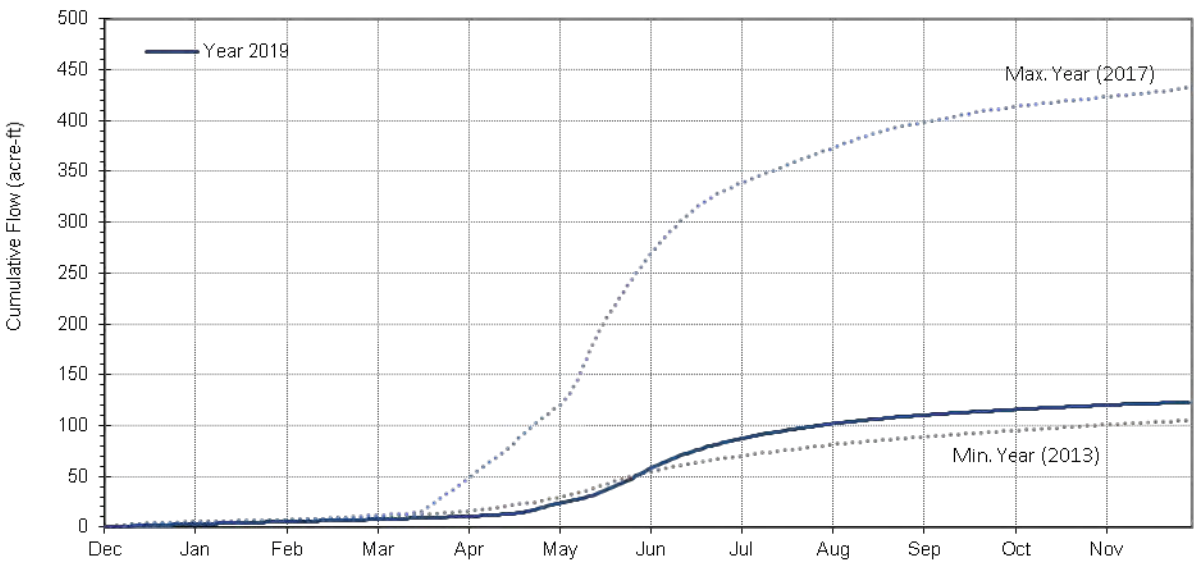
DATE: JUNE 2020

BY: WSB | FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj2\010109\plt\EffectivenessMonPlan\2019AnnRpt\Fig3_2_EffSWLocs.mxd




Notes:

1. Flows less than approximately 0.01 cfs correspond to water depths in the flume of less than 0.25 inches. These flows are considered less reliable due to potential measurement errors at low flows.

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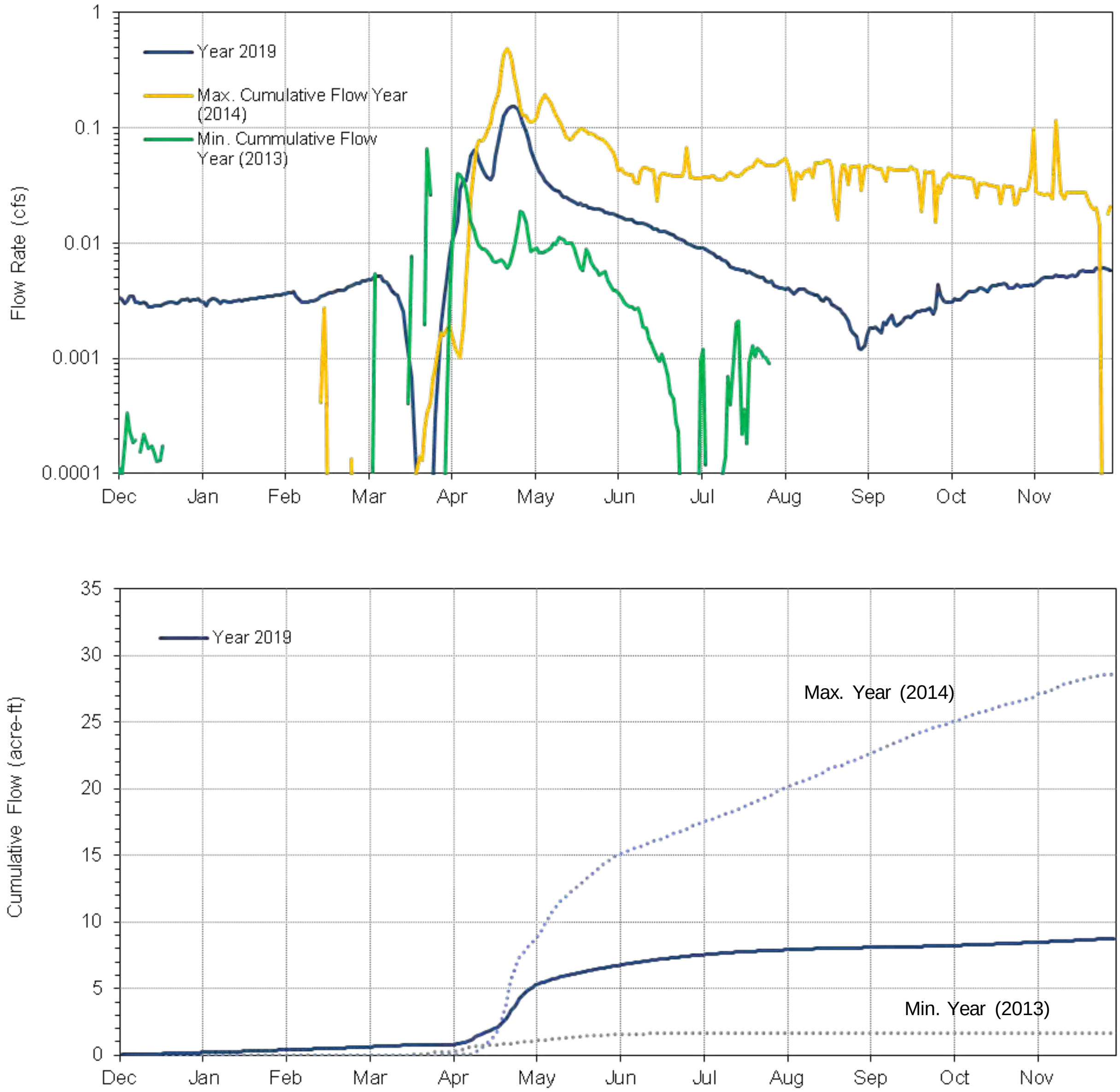
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-3

**ANNUAL HYDROGRAPH FOR STATION UP-IN (UPSTREAM OF THE INFILTRATION BASIN)**

| | | |
|---|---|---|
| DATE: JULY 2020 | | FORMATION ENVIRONMENTAL |
| BY: LJM | FOR: ACK | |

"S:\JOBS\SMOKY\CERCLA\POLENTCRA\ANNRPT\2019\DRAFT\FIGS\FIGSPORTRAIT_2019.PPTX"




# J.R. SIMPLOT COMPANY

SMOKY CANYON MINE

2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-4

## ANNUAL HYDROGRAPH FOR STATION LP-1 (AT TOE OF ODA)

DATE: JULY 2020

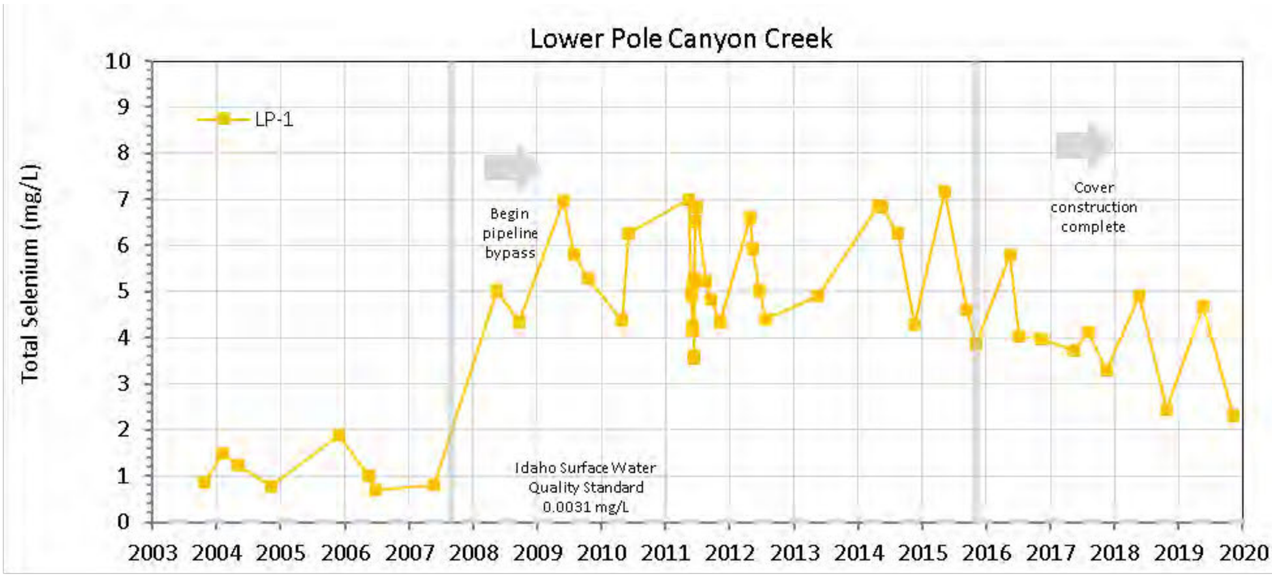
BY: LJM FOR: ACK

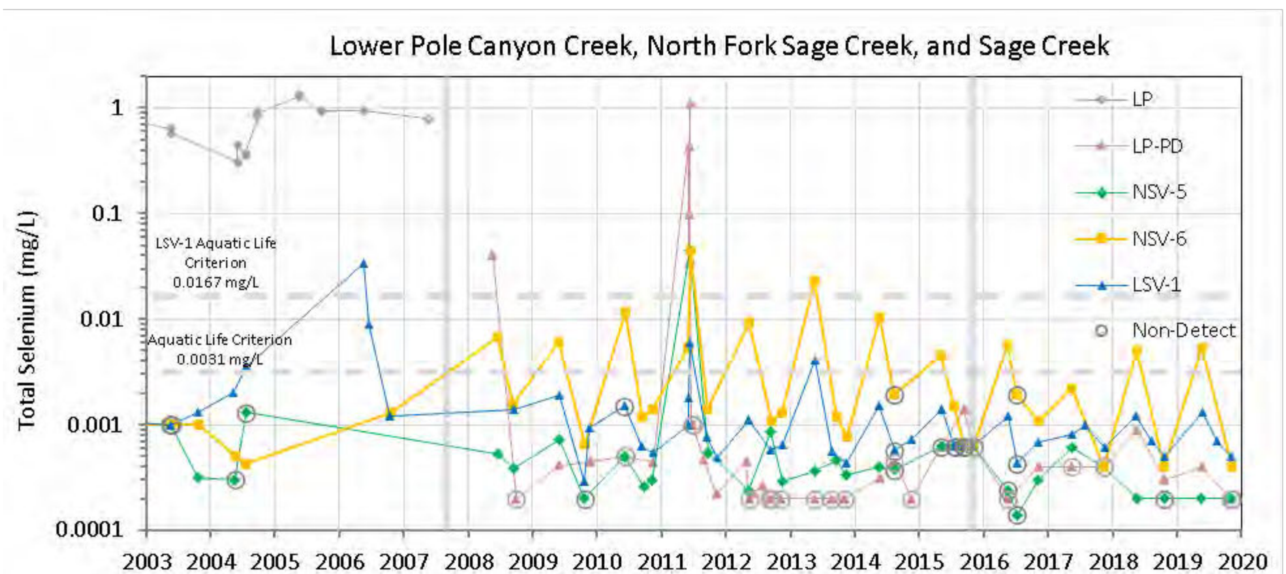
FORMATION ENVIRONMENTAL

Notes:

1. Flows less than approximately 0.01 cfs correspond to water depths in the flume of less than 0.25 inches. These flows are considered less reliable due to potential measurement errors at low flows.

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\Hydrographs_UPIN_LP1_2019.xlsx"




**J.R. SIMPLOT COMPANY**
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

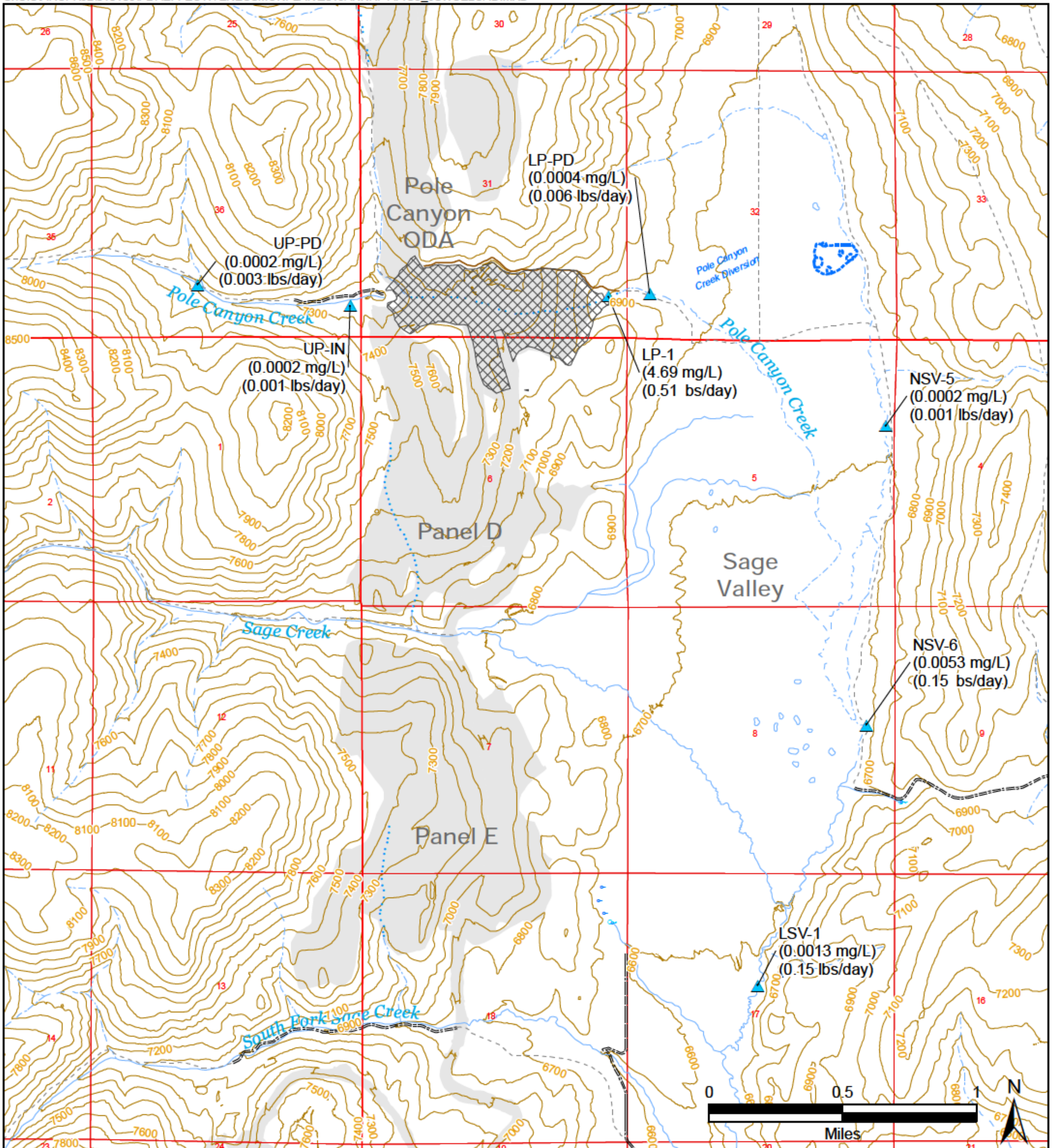
FIGURE 3-5

**TOTAL SELENIUM CONCENTRATIONS IN LOWER POLE CANYON CREEK, NORTH FORK SAGE CREEK, AND SAGE CREEK**

DATE: JULY 2020
BY: WSB
FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010109\PLT\EFFECTIVENESSMONPLAN\2019ANNRPT\FIG3_6SWSELOAD.MXD




## Legend

- Surface Water Monitoring Locations
- Dinwoody/Chert Cover on Pole Canyon ODA (140 acres)
- Mine Disturbance Areas

Notes:
1. Topographic surface reflects 2015 conditions in mine disturbance areas.
2. Surface water total selenium concentrations and loading were calculated for May 21-22, 2019.

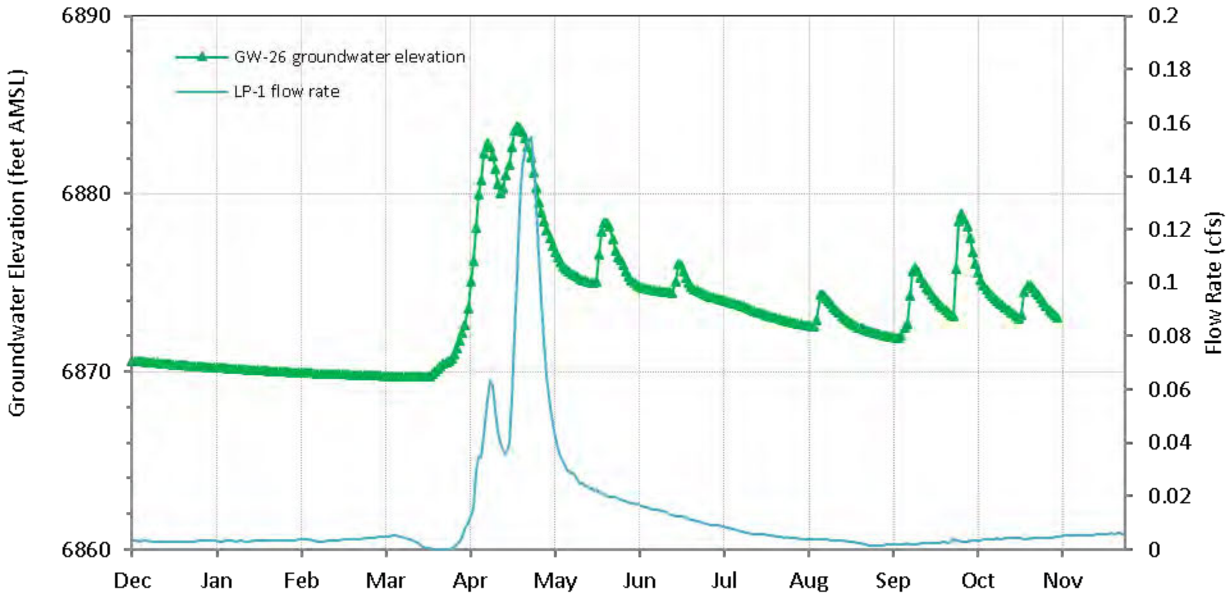
J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITOR NG REPORT

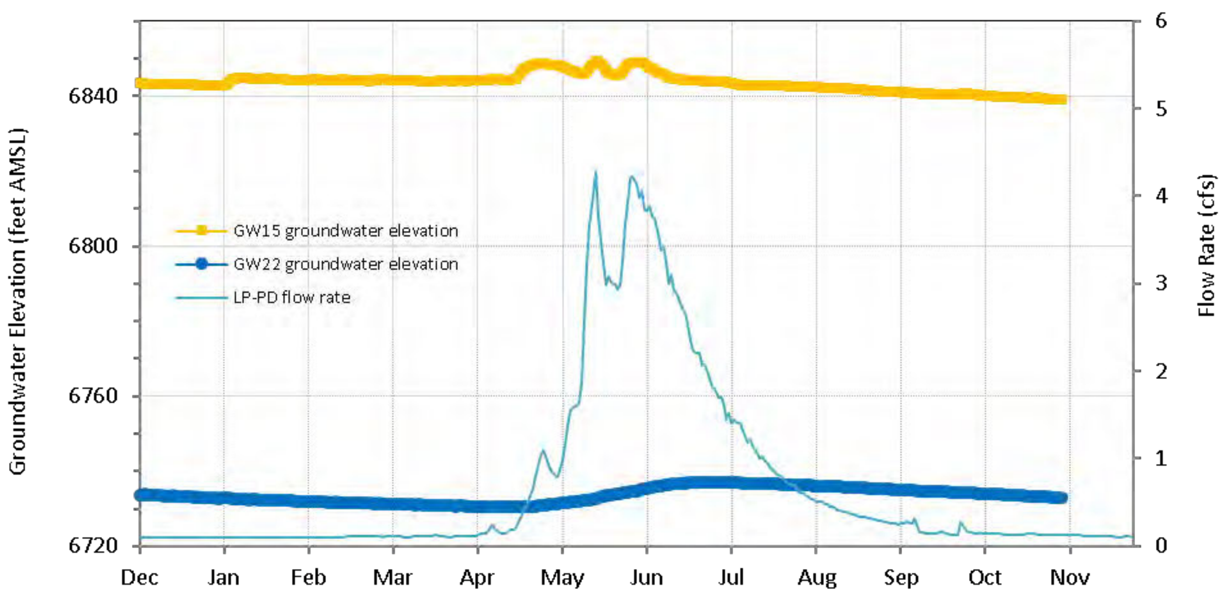
FIGURE 3-6
SURFACE WATER TOTAL SELENIUM CONCENTRATIONS AND LOADING (MAY 2019)

DATE: JUN 17, 2020
BY: LJM
FOR: ACK

FORMATION ENVIRONMENTAL

"S:\JOBS\SMOKY\CERCLA\POLENTCRA\ANNRPT\2019\DRAFT\FIGS\FIGSPORTRAIT_2019.PPTX"




Notes:

1. Flows less than approximately 0.01 cfs correspond to water depths in the flume of less than 0.25 inches. These flows are considered less reliable due to potential measurement errors at low flows.

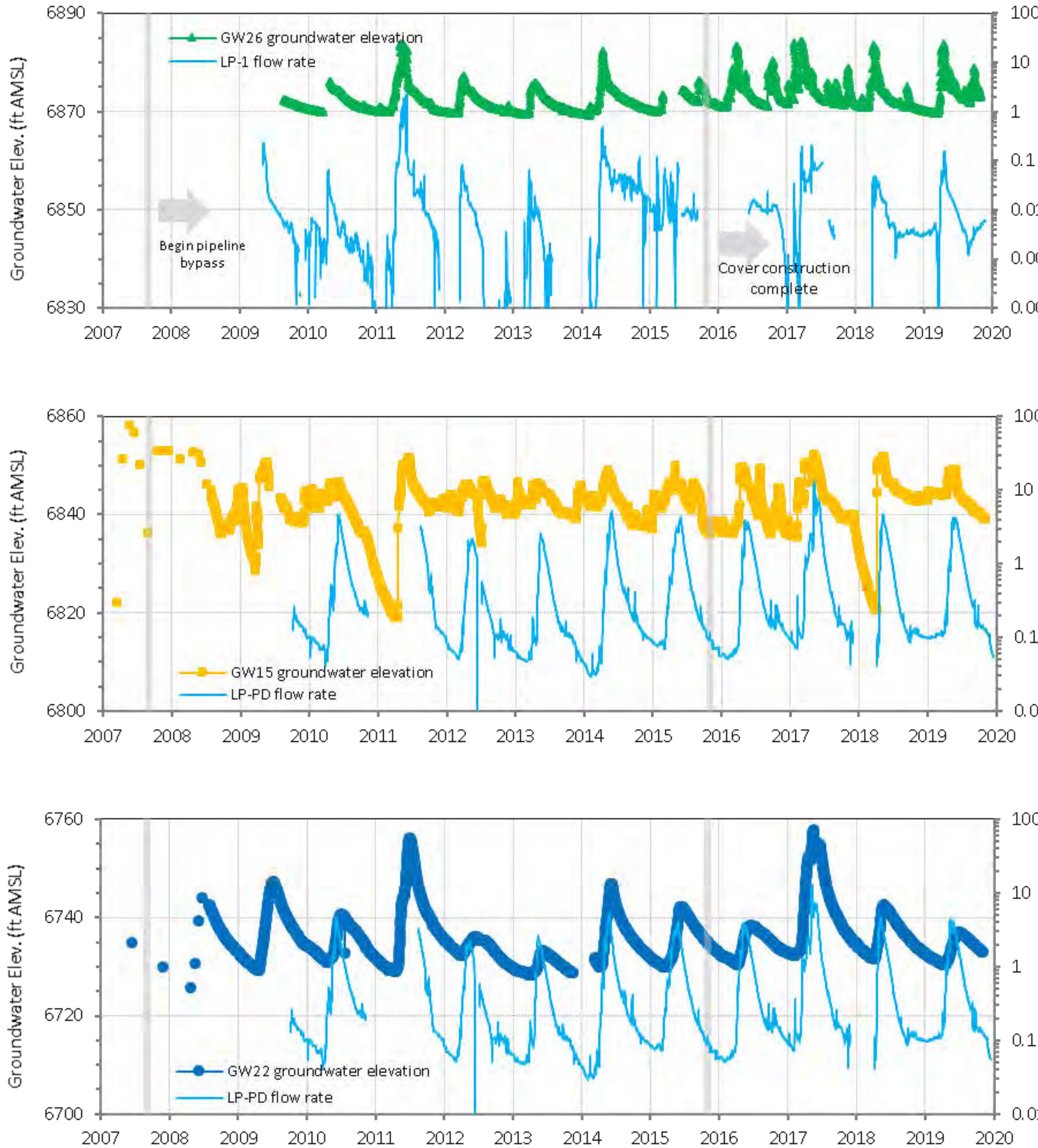
**J.R. SIMPLOT COMPANY**
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-7

**2019 ALLUVIAL GROUNDWATER ELEVATIONS WITH LP-1 AND LP-PD FLOWS**

| | | |
|---|---|---|
| DATE: JULY 2020 | | FORMATION ENVIRONMENTAL |
| BY: LJM | FOR: ACK | |

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\PoleHydrographs_GW_2019.xlsx"




Notes:

1. LP-1 transducer vent line became plugged from July 14 through August 16, 2017 and September 15 through November 15, 2018, providing questionable data. Flow rate was estimated using linear interpolation for cumulative flow estimate.
2. LP-PD flow data is unavailable from December 2018 to April 2018. Streamflow began bypassing the pipeline inlet in December 2017 and flowed to the infiltration basin. As flows increased, streamflow resumed flowing through the pipeline in April 2018. Repairs were made to the inlet in July by filling a hole beneath the structure with about 100 pounds of granular bentonite.
3. Flows less than approximately 0.01 cfs correspond to water depths in the flume of less than 0.25 inches. These flows are considered less reliable due to potential measurement errors at low flows.

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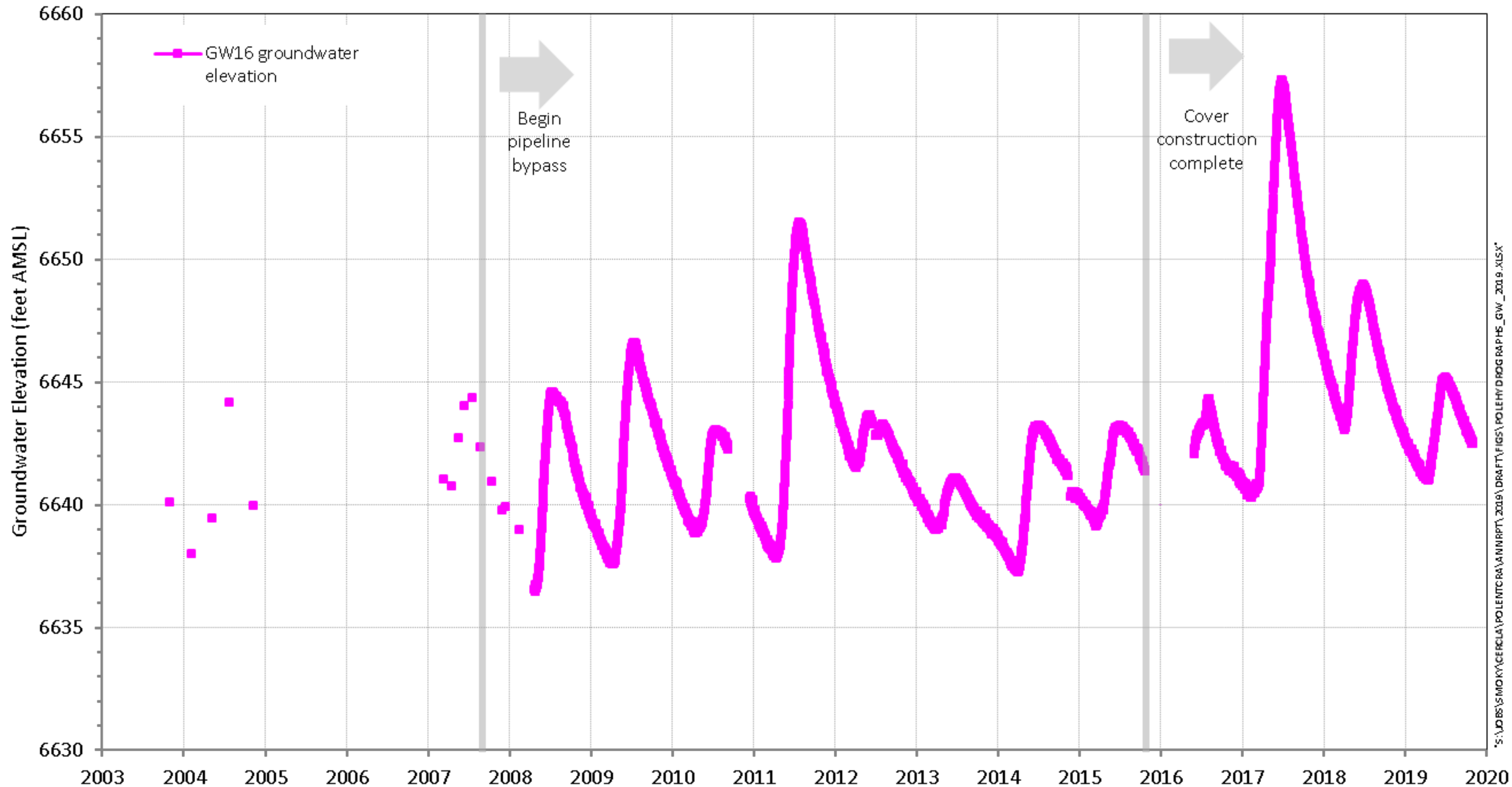
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 3-8

**LONG-TERM ALLUVIAL GROUNDWATER ELEVATIONS WITH LP-1 AND LP-PD FLOWS**

| | | |
|---|---|---|
| DATE: JULY 2020 | | FORMATION ENVIRONMENTAL |
| BY: LJM | FOR: ACK | |

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\PoleHydrographs_GW_2019.xlsx"




Notes:
1. Continuous groundwater elevation monitoring began in April 2008 for GW-16.

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SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

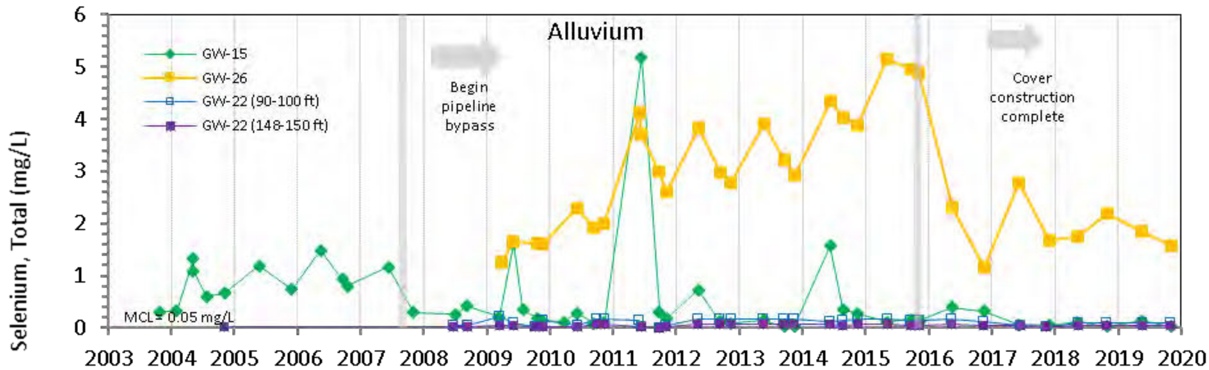
FIGURE 3-9

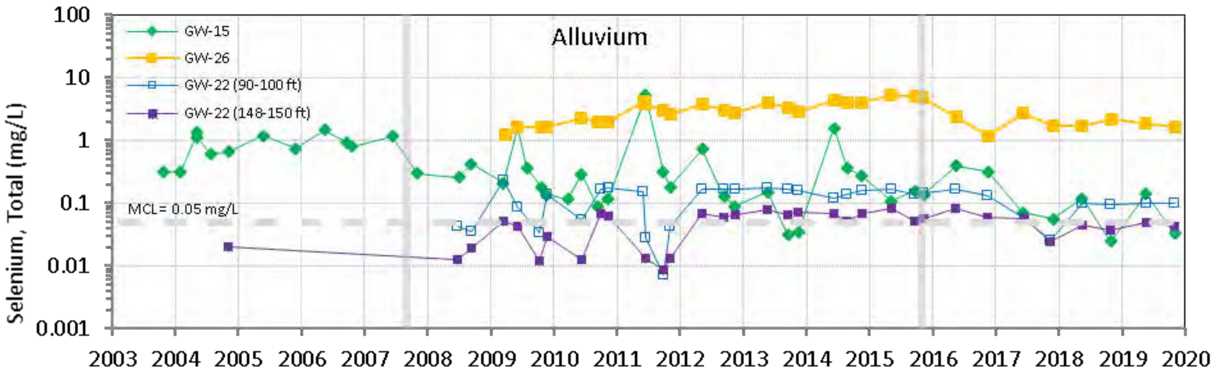
**WELLS FORMATION GROUNDWATER ELEVATIONS**

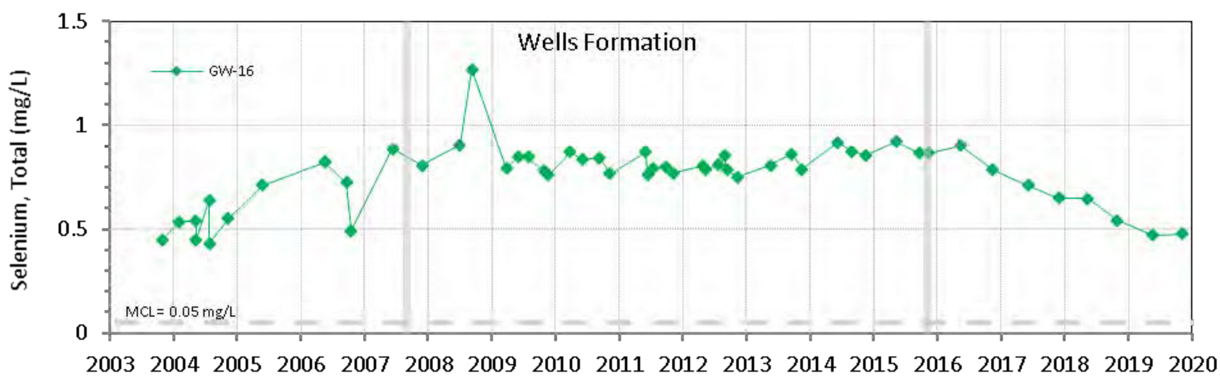
DATE: JULY 2020
BY: LJM
FOR: ACK

FORMATION ENVIRONMENTAL

"S:\JOBS\SMOKY\CERCLA\POLENTCRA\ANNRPT\2019\DRAFT\FIGS\FIGSPORTRAIT_2019 PPTX"




**J.R. SIMPLOT COMPANY**
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

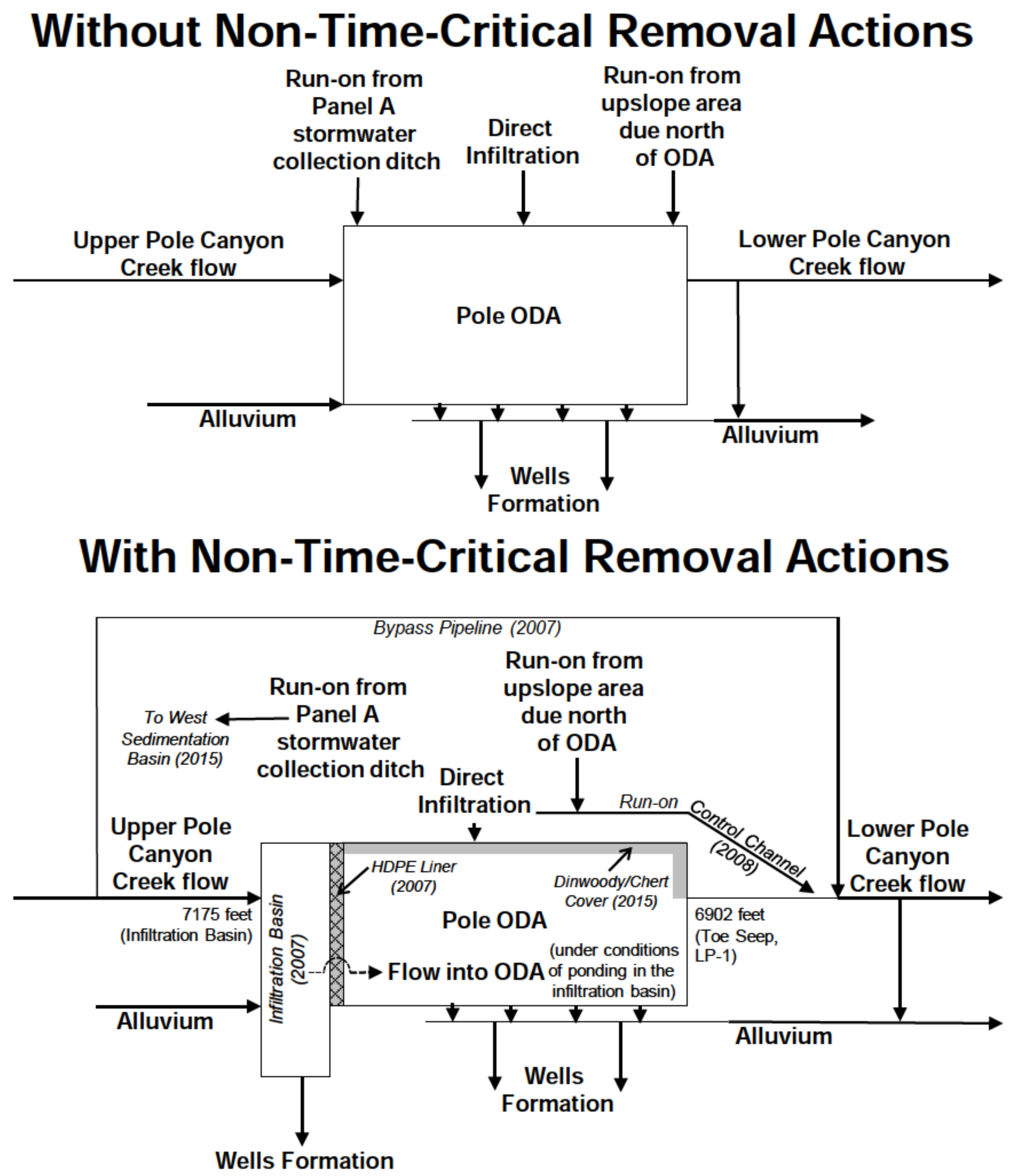
FIGURE 3-10

**TOTAL SELENIUM CONCENTRATIONS IN ALLUVIAL AND WELLS FORMATION GROUNDWATER**

DATE: JULY 2020
BY: LJM FOR: ACK

FORMATION ENVIRONMENTAL

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2018\Draft\Figures\SeTimeseries_2018.xlsx"




Notes:

1. The "Without Non-Time-Critical Removal Actions" model represents the model inputs/outputs before the Removal Actions were constructed or if the Removal Actions had not been constructed (i.e., the "no action" scenario).
2. The "With Non-Time-Critical Removal Actions" model represents the model inputs/outputs after the Removal Actions were constructed (i.e., the "as-built" scenario).
3. The Non-Time-Critical Removal Action components are in italics with the year of construction in parentheses.
4. There is an impermeable barrier between the infiltration basin and the Pole Canyon ODA, which greatly limits surface or alluvial water in the upper Pole Canyon Creek drainage from entering the ODA.

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE 4-1

WATER BALANCE CONCEPTUAL MODEL

DATE: JULY 2020

BY: LJM | FOR: ACK

FORMATION ENVIRONMENTAL

# APPENDIX A

## Inspection Forms and Photographs

**Spring Inspection**

**Pole Canyon 2006 NTCRA**

**(May 21, 2019)**

# Inspection Record

## Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: 5/21/19 Partly cloudy/overcast Personnel: LJM

| Pipeline, Access, Vents | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Pipeline** | | | |
| General condition | Good | | Pipeline route looks good, no erosion, settling, ponding or saturation |
| Connection to inlet structure | Not observed | | |
| Saturated zones | None | 4169 4176 | |
| Erosion over pipe | No significant erosion | 4170 4178 4175 | |
| Alignment settlement or ponding | No | | |
| Interior inspection? | No | | |
| Vegetation growth | Normal | | |
| *Attach documentation if pressure testing is needed* | | | |
| **Access Points and Vents** | | | |
| General condition | Good | | |
| Vent/access (Sta. 4+50) | Good | 4166 | |
| Concrete manhole (Sta. 68+15) | Did not observe | | |
| Vent/access (Sta. 13+00) | Good | | |
| Vent screens | Clear | 4167, 4168 | |
| Buried access markers (at approx. Sta. 23+00, 32+60, 38+50, 48+50) | Not observed | | |

*Summary of Conditions:*

| Bypass Pipeline Inlet Structure, Gates, Weir | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Inlet System** | | | |
| General condition | Good | | Inlet looks good; flow entering okay; repairs made previously look good |
| Erosion and riprap | Good, no erosion | 4096 4097 | |
| Stability | Good | | |
| Concrete condition | Good | 4106, 4107, 4108 | |
| Handrail, safety grate | Good | 4098 | |
| Inlet grizzly | Some rocks/sticks | 4100 4101 | |
| Floor grating | | | |
| Sediment/debris | Did not drain, ell, should be ... | | |
| **Gates and Valves (see manufacturer's O&M info for gates and valves)** | | | |
| Sluice gate (30") | okay | | |
| Sediment sluice gate (24") | okay | | |
| Drain (blind flange) | okay | | |
| **Weir and Monitoring Setup** | | | |
| General condition | okay | | |
| Level check for weir | flow even with notches | 4161, 4162 | |
| Condition of steel | appears okay | 4161 | |
| Monitoring setup condition | Good | 4102 4103, 4104 | |
| Staff gage | Good | | |
| Datalogger condition/operation | Okay | ~~4102~~ ~~4103~~ 4101 LJM | |

*Summary of Conditions:*

 Revised August 2013

# Inspection Record

## Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: Personnel:

| Infiltration Basin, Spillway, Sedimentation Basin | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Sedimentation Basin** | | | |
| General condition | GOOD | 4136, 4138, 4137, 4139 | NO SIGNIFICANT EROSION, BANKS MOSTLY BARE, SOME VEG, (GRASS) ON VEG MATS, WATER IN BASIN |
| Erosion | NO SIGNIFICANT | | |
| Riprap | GOOD | | |
| Sedimentation in basin | WATER IN BASIN | | |
| Vegetation adjacent/within basin | SOME GRASS ON BANKS | | |
| **Spillway into Infiltration Basin** | | | |
| General condition | GOOD | 4187, 4188 | |
| Erosion at edges | NONE | | |
| Riprap stability | GOOD | | |
| **Infiltration Basin** | | | |
| General condition | GOOD | 4190, 4192 | MINOR RILLS FROM ACCESS RD TO BASIN |
| Erosion at edges | SOME | 4193 | |
| Stability of rock cover | GOOD | | |
| Fine sediment in basin | SOME | | |
| Sinkholes in basin | NONE | | |
| Vegetation coverage | SOME ON EDGES | | |
| Seepage (visible) | NONE | | |
| Sloughing on sides | NONE | | |
| Other | | | |

*Summary of Conditions:*

| Pole Canyon Run-On Control Channel | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Reaches 1 and 2 – Channel** | | | |
| General condition, TRM condition | GOOD | 4211, 4212 | |
| Erosion/sedimentation | NONE | | |
| Vegetation growth | SOME | | |
| Side-hill inflows | NONE | | |
| Ponding/settlement | NONE | | |
| **Reaches 1 and 2 – Embankments** | | | |
| Upstream separation berm, crest | GOOD | | |
| Side slopes – vegetation | SOME | | |
| **Reach 3 – Channel** | | | |
| General condition, TRM condition | OK | 4219 | |
| Sedimentation/debris | SOME | | |
| Vegetation growth | SOME | | |
| Ponding/settlement | NONE | | |
| **Reach 3 – Cut Slopes** | | | |
| Stability | GOOD | | |
| Erosion | NONE | | |
| Vegetation growth | SOME | | |

 Revised August 2013

## Inspection Record

### Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: Personnel:

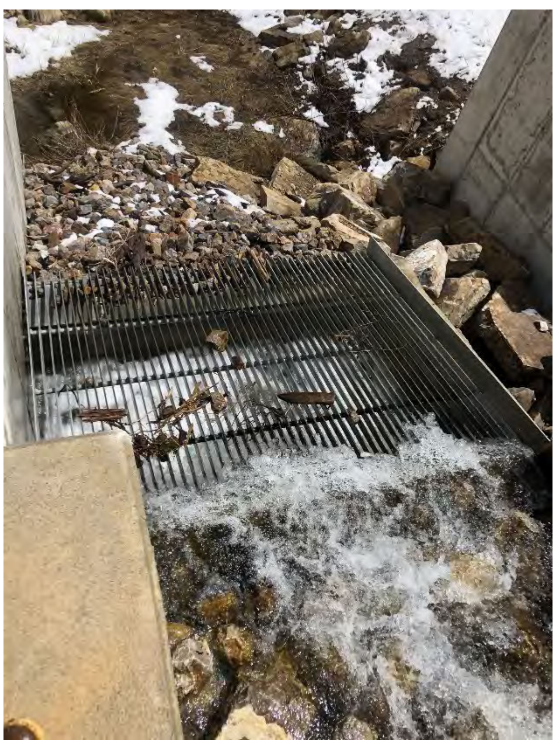
| | | | |
|---|---|---|---|
| **Reach 4 – Steep Chute – Channel** | | | |
| General condition | Good | 4200, 4199, 4216 | |
| Upstream cutoff wall | | | |
| ACB unit condition/stability | okay | | |
| Erosion | NONE | | |
| Soil infill | some, [illegible] | | |
| Vegetation growth | okay | | |
| **Reach 4 – Steep Chute – Embankments** | | | |
| Crest, side slopes | okay | | |
| Vegetation growth | okay | | |
| **Outfall and Dissipation Basin** | | | |
| General condition | okay | 4197 | |
| Concrete cutoff wall | okay | | |
| Riprap/grouted riprap stability | okay | | |
| Sedimentation, debris | Some | | |
| Embankment stability | okay | | |
| Erosion | none | | |
| **Sedimentation Basin and Discharge to Channel** | | | |
| General condition | Good | | |
| Sedimentation, debris | none | | |
| Erosion | NONE | | |
| End rock zone | okay | | |
| Downstream channel | okay | | |

*Summary of Conditions:*

| Pipeline Dissipation Structure, Weir | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Outlet/Energy Dissipation Structure** | | | |
| General condition | | 4207 | |
| Erosion | | | |
| Sediment in invert | | | |
| Concrete condition | | | |
| Riprap at outlet | | | |
| Pipe connection | | | |
| Vegetation around structure | | | |
| **Discharge Weir** | | | |
| General condition | GOOD | 4205, 4209 | |
| Level/position check | Good | | |
| Condition of steel | Good | | |
| Staff gage | Good | 4202 | |
| Datalogger condition/operation | OPERATING | 4204 | |

*Summary of Conditions:*

Pipeline Inlet Structure (UP-PD) – riprap lined channel upstream of inlet (looking downstream); May21, 2019.



Pipeline Inlet Structure (UP-PD) – inlet grizzly (looking downstream); May 21, 2019.

Pipeline Inlet Structure (UP-PD) – riprap lined channel and inlet grizzly (looking upstream); May 21, 2019.

Pipeline Inlet Structure (UP-PD) – handrail, sluice gate hand wheels and telemetry system; May 21, 2019.

Pipeline Inlet Structure (UP-PD) – staff gauge and weir plate; May 21, 2019.

Pipeline Inlet Structure (UP-PD) – inlets structure concrete condition and sediment discharge port; May 21, 2019.

Bypass Pipeline – vent, upstream of infiltration basin and haul road (looking east); May 21, 2019.

Bypass Pipeline – vent screen, upstream of infiltration basin and haul road (looking east); May 21, 2019.

Bypass Pipeline – alignment upstream of infiltration basin and haul road (looking east); May 21, 2019.

Bypass Pipeline – alignment upstream of infiltration basin and haul road (looking east); May 21, 2019.

Bypass Pipeline – alignment downstream of infiltration basin and haul road (looking east); May 21, 2019.

Infiltration Basin (UP-IN) – sedimentation pond upstream of infiltration basin – looking east towards Pole Canyon ODA, May 21, 2019.

Infiltration Basin (UP-IN) – sedimentation pond upstream of infiltration basin – looking upstream, May 21, 2019.

Infiltration Basin (UP-IN) – looking east towards Pole Canyon ODA; May 21, 2019.

Run-on Control Channel – upper section east of the haul road (looking west); May 21, 2019.

Run-on Control Channel – upper section east of the haul road (looking east); May 21, 2019.

Run-on Control Channel – middle section (looking east); May 21, 2019.

Run-on Control Channel – lower section (looking west); May 2019.

Run-on Control Channel – lower section and sedimentation basin (looking east); May 21, 2019.

Pipeline Outlet Structure (LP-PD) –weir and dissipation structure; May 21, 2019.

Pipeline Outlet Structure (LP-PD) –weir and staff plate; May 21, 2019.

**Fall Inspection**

**Pole Canyon 2006 NTCRA**

**(November 4, 2019)**

# Inspection Record

## Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: 11/14/19 @ 1135 Sunny clear, snow on ground Personnel: CJM

| Pipeline, Access, Vents | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Pipeline** | | | |
| General condition | Good | 7 | Access road snow covered but no visible erosion or settling photos 7, 16, 17, 19, 22, 23 |
| Connection to inlet structure | Not observed | | |
| Saturated zones | None observed (snow covered) | | |
| Erosion over pipe | None observed (snow covered) | | |
| Alignment settlement or ponding | None observed (snow) | | |
| Interior inspection? | Not access | | |
| Vegetation growth | Snow covered | | |
| *Attach documentation if pressure testing is needed* | | | |
| **Access Points and Vents** | | | |
| General condition | Good | | |
| Vent/access (Sta. 4+50) | Good | 18 | |
| Concrete manhole (Sta. 68+15) | Not observed | | |
| Vent/access (Sta. 13+00) | Good | 20 | |
| Vent screens | Clear | 21 | |
| Buried access markers (at approx. Sta. 23+00, 32+60, 38+50, 48+50) | Not observed | | |

*Summary of Conditions:*

| Bypass Pipeline Inlet Structure, Gates, Weir | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Inlet System** | | | |
| General condition | Good | 6, 19 | |
| Erosion and riprap | Snow covered | ~~5~~ 1, 15 | |
| Stability | Good | | |
| Concrete condition | Good | 3, 4 | |
| Handrail, safety grate | Good | | |
| Inlet grizzly | Snow covered | 2 | |
| Floor grating | Snow covered | 9 | |
| Sediment/debris | | | |
| **Gates and Valves (see manufacturer's O&M info for gates and valves)** | | | |
| Sluice gate (30") | Good | 8 → hand wheel | |
| Sediment sluice gate (24") | Good | 10 → hand wheel | |
| Drain (blind flange) | Good | | |
| **Weir and Monitoring Setup** | | | |
| General condition | Good | | Cable connected to telemetry okay but not uploading data, Evan with TRC to manual download |
| Level check for weir | Even flow over notches | 12 | |
| Condition of steel | Good | | |
| Monitoring setup condition | Good | | |
| Staff gage | Good | 11 | |
| Datalogger condition/operation | Not upload telemetry | | |

*Summary of Conditions:*

## Inspection Record

### Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: Personnel:

| Infiltration Basin, Spillway, Sedimentation Basin | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Sedimentation Basin** | | | |
| General condition | GOOD | 24, 29 | SOME TRM MISSING |
| Erosion | MINIMAL / SNOW COVERED | 25 | |
| Riprap | GOOD | 26, 27 | |
| Sedimentation in basin | ICE IN BASIN | | |
| Vegetation adjacent/within basin | SNOW COVERED | | |
| **Spillway into Infiltration Basin** | | | |
| General condition | GOOD | 28 | |
| Erosion at edges | ~~SOME~~ NONE | | |
| Riprap stability | GOOD | 35 | |
| **Infiltration Basin** | | | |
| General condition | GOOD | 30, 36 | RUNOFF FROM ACCESS RD ERODED SMALL GULLY INTO BASIN, NORTH OF SED BASIN SPILLWAY, FIX W/ SMALL BERM? |
| Erosion at edges | ~~NONE~~ SOME | 31, 32, 33, 34, 37 | |
| Stability of rock cover | GOOD | | |
| Fine sediment in basin | SNOW COVERED | | |
| Sinkholes in basin | NONE | | |
| Vegetation coverage | OKAY, SNOW COVERED | | |
| Seepage (visible) | NONE | | |
| Sloughing on sides | NONE | | |
| Other | | | |

*Summary of Conditions:*

| Pole Canyon Run-On Control Channel | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **Reaches 1 and 2 – Channel** | | | |
| General condition, TRM condition | GOOD, SOME SNOW | | SEE PHOTOS ~~38-44~~ LJ-38-45 |
| Erosion/sedimentation | NONE | | |
| Vegetation growth | OKAY AS VISIBLE (SNOW) | | |
| Side-hill inflows | NONE | | |
| Ponding/settlement | NONE | | |
| **Reaches 1 and 2 – Embankments** | | | |
| Upstream separation berm, crest | GOOD | | |
| Side slopes – vegetation | GOOD (SNOW) | | |
| **Reach 3 – Channel** | | | |
| General condition, TRM condition | GOOD | | See Photos 46-48 |
| Sedimentation/debris | NONE | | |
| Vegetation growth | OKAY (SNOW) | | |
| Ponding/settlement | NONE | | |
| **Reach 3 – Cut Slopes** | | | |
| Stability | GOOD | | |
| Erosion | NONE | | |
| Vegetation growth | OKAY | | |



Revised August 2013

# Inspection Record

## Pole Canyon Removal Action – Pipeline, Infiltration Basin, Run-on Control Channel

Date, Time, Weather Conditions: Personnel:

| | | | |
|---|---|---|---|
| **Reach 4 – Steep Chute – Channel** | | | |
| General condition | GOOD | | SEE PHOTOS 49 – 59 |
| Upstream cutoff wall | GOOD | | |
| ACB unit condition/stability | GOOD | | |
| Erosion | NONE | | |
| Soil infill | NONE | | |
| Vegetation growth | GOOD | | |
| **Reach 4 – Steep Chute – Embankments** | | | |
| Crest, side slopes | GOOD | | |
| Vegetation growth | GOOD | | |
| **Outfall and Dissipation Basin** | | | |
| General condition | GOOD | | SEE PHOTOS 60-62 AND 64-65 |
| Concrete cutoff wall | GOOD | | |
| Riprap/grouted riprap stability | GOOD | | |
| Sedimentation, debris | MINIMAL | | |
| Embankment stability | GOOD | | |
| Erosion | NONE | | |
| **Sedimentation Basin and Discharge to Channel** | | | |
| General condition | GOOD | | ~~65~~ SEE PHOTOS 63 |
| Sedimentation, debris | NONE | | |
| Erosion | NONE | | |
| End rock zone | ~~[illegible]~~ GOOD | | |
| Downstream channel | GOOD | | |

*Summary of Conditions:*

| Pipeline Dissipation Structure, Weir | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **Outlet/Energy Dissipation Structure** | | | |
| General condition | GOOD | 48, 69 | |
| Erosion | NONE | | |
| Sediment in invert | NONE OBSERVED | | |
| Concrete condition | GOOD | | |
| Riprap at outlet | GOOD, SNOW | | |
| Pipe connection | NOT CHECKED | | |
| Vegetation around structure | GOOD | | |
| **Discharge Weir** | | | |
| General condition | GOOD | 67, 68, 69 | |
| Level/position check | NOT CHECKED | | |
| Condition of steel | GOOD | | |
| Staff gage | GOOD | 66 | |
| Datalogger condition/operation | GOOD | | |

*Summary of Conditions:*

Pipeline Inlet Structure (UP-PD) – riprap lined channel and inlet grizzly (looking upstream); November 4, 2019.

Pipeline Inlet Structure (UP-PD) – inlet structure concrete condition and sediment discharge port; November 4, 2019.

Pipeline Inlet Structure (UP-PD) – staff plate and weir; November 4, 2019.

Pipeline Inlet Structure (UP-PD) – handrail, sluice gate hand wheels and telemetry system; November 4, 2019.

Bypass Pipeline – alignment upstream of infiltration basin and haul road (looking east); November 4, 2019.

Bypass Pipeline – vent, upstream of infiltration basin and haul road (looking east); November 4, 2019.

Bypass Pipeline – vent screen; November 4, 2019.

Bypass Pipeline – alignment upstream of the infiltration basin and haul road (looking east); November 4, 2019.

Infiltration Basin – sedimentation basin upstream of infiltration basin (looking east towards Pole Canyon ODA); November 4, 2019.

Infiltration Basin – sedimentation basin upstream of infiltration basin (looking west); November 4, 2019.

Infiltration Basin – base area and rock protection - looking east towards Pole Canyon ODA; November 4, 2019.

Run-on Control Channel – upper section east of the haul road (looking west); November 4, 2019.

Run-on Control Channel – upper section east of haul road (looking east); November 4, 2019.

Run-on Control Channel– middle section (looking east), November 4, 2019.

Run-on Control Channel – lower section (looking west); November 4, 2019.

Run-on Control Channel –sediment basin (looking east); November 4, 2019.

Pipeline Outlet Structure (LP-PD) – V-notch weir (looking upstream); November 4, 2019.

Pipeline Outlet Structure (LP-PD) – V-notch weir and staff plate (looking downstream); November 4, 2019.

**Spring Inspection**

**Pole Canyon 2013 NTCRA**

**(June 11, 2019)**

## Inspection Form 1
## NTCRA Cover System and Access Roads

| DATE/TIME: Tuesday, June 11, 2019 9:30-1:30 | WEATHER CONDITIONS/TEMPERATURE: |
|---|---|
| PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank | Sunny, Cool to warm |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **WEST-SIDE COVER SYSTEM** | | | |
| **Upper West-Side** | | | |
| General Condition | Good | | |
| Erosion | Good | | |
| Vegetative Growth | OK | | |
| Wattle Conditon | OK | | |
| Rock Stability Buttresses | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Central Bench Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None | | |
| Gravel Surfacing | Good | | |
| Culvert to West EDS | Good | | |
| Rock Buttress Below | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Lower-West Side** | | | |
| Vegetative Growth | Good | | |
| Watttle Condition | Good | | |
| Pooling at Base | None | | |
| Silt Fence | Good | | |
| Runoff to Infil. Basin | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **South-Central Area** | | | |
| General Condition | Good | | |
| Vegetative Growth | Good | 1 | |
| Wattle Conditon | Good | | |
| Erosion | Good | | |
| Access from Haul Road | Good | | |
| Silt Fence | None | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **EAST-SIDE COVER SYSTEM** | | | |
| **Top East Area** | | | |
| General Condition | Good | | |
| Pooling | Good | | |
| East Runoff Berm | Good | | |
| Vegetative Growth (slopes and ditches) | Good | 6 | |
| Erosion | Good | | |
| 24" Culvert at Access Rd. | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Blast Compound Area** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Access from Haul Road | Good | | |
| Security Fencing | Good | | |
| Other | | | |

## Inspection Form 1
## NTCRA Cover System and Access Roads

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **EAST-SIDE COVER SYSTEM (continued)** | | | |
| **SW Side Slope** | | | |
| Stability | Good | | |
| Erosion | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Other | | | |
| **South East-Side Slope** | | | |
| General condition | Good | | |
| Wattle Conditions | Good | | |
| Access Rd. from South | Good | | |
| Erosion | OK | | |
| Vegetative Growth | OK | | |
| Slope Stability | Good | | |
| Other | | | |
| **South East Seep Zone** | | | |
| General Conditon | Good | | |
| Erosion | minor | | |
| Drainage of Seeps | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Area Stability | Good | | |
| Access Road | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Upper East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | Some rilling | 3,4 | Work done last year looks good. Need some additional wood straws installed. |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| East-Face Runoff Ditch | Good | | |
| 36" CMP Culvert & Road | Good | | |
| Runoff Area to East EDS | Good | | |
| Other | | | |
| **Middle East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | OK | | |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| Lower East Runoff Ditch | Good | | |
| Access Road | Good | | |
| Other | | | |
| **Lower East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | Good | | |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| Large Rock Toe Zone | Good | | |
| Access Road | Good | | |
| Silt Fence | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |

## Inspection Form 2
## NTCRA West-Side Drainage Control Features

| | |
|---|---|
| **DATE/TIME: Tuesday, June 11, 2019 9:30-1:30** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank** | **Sunny, Cool to warm** |

| **Location** | **Condition** | **Photo No.** | **Comments** Actions Needed or Taken |
|---|---|---|---|
| **PANEL A RUNOFF, INLET TO HAUL-ROAD CULVERT, CULVERT, AND UPPER WEST-SIDE RUNOFF** | | | |
| **Panel A Runoff and Inlet to 42-Inch Culvert** | | | |
| General Condition | OK | | |
| Erosion/Sedimentation | Good | | |
| Riprap in Channel | Good | | |
| Stability of Hillside | OK | | |
| Concrete Inlet Structure | Good; clear of sediment | | |
| Trash Rack Condition | Good | | |
| Debris at Inlet | Clear | | |
| Other | | | |
| **42-Inch CMP Culvert** | | | |
| General CMP Condition | Good | | |
| Sedimentation in CMP | Good | | |
| Stability of Cover | Good | | |
| Outlet Grouted Riprap | Good | | |
| Other | | | |
| **Runoff to West Energy Dissipation Structure (EDS)** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Some Minor | | |
| Riprap in Channel | Good | | |
| Embankment Stability | Good | | |
| Ditch Curve Section | Good | | |
| Access along Channel | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **WEST ENERGY DISSIPATION STRUCTURE AND LOWER WEST-SIDE RUNOFF** | | | |
| **West Energy Dissipation Structure** | | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Sedimentation | Significant | 2 | Need to remove sediment |
| Ditch to Culvert | Good | | |
| Other | | | |
| **48-Inch CMP Culvert** | | | |
| General CMP Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Inlet/Outlet | Good | | |
| Cover Fill | Good | | |
| Other | | | |
| **Lower Runoff Ditch** | | | |
| General Conditon | Good | | |
| Stability (Access Road) | Good | | |
| Riprap Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Other | | | |
| **Outfall to West Sedimentation Basin** | | | |
| General Condition | Good | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Erosion | None observed | | |
| Other | | | |

## Inspection Form 2
## NTCRA West-Side Drainage Control Features

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **DISCHARGE FROM NW BASIN TO INFILTRATION BASIN** | | | |
| General Condition | Good | | |
| TRM Lining in Ditch | Good | | |
| Erosion | None observed | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap Chute | Good | | |
| Outfall into Infil. Basin | Good | | |
| Vegetation | Good | | |
| | | | |

| | | | |
|---|---|---|---|
| **SOUTH RUN-ON DITCHES** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Silt Fencing | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH WEST-SIDE RUNOFF SYSTEM** | | | |
| **South Runoff Ditch to West-Side South Sedimentation Basin** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Rock Riprap Stability | Good | | |
| Silt Fencing | - | | |
| Other | | | |
| **Discharge Ditch from West-Side South Basin** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Riprpap Conditon | Good | | |
| Grouted Riprap Outfall | Good | | |
| Other | | | |
| **36-Inch CMP South Haul Road Culvert** | | | |
| General CMP Condition | Good | | |
| Cover Fill | Good | | |
| Inlet/Outlet | Good | | |
| Riprap at Outlet | Good | | |
| Other | | | |



Form Date: February 2016

## Inspection Form 3
## NTCRA East-Side Drainage Control Features

| | |
|---|---|
| **DATE/TIME: Tuesday, June 11, 2019 9:30-1:30** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank** | **Sunny, Cool to warm** |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **EAST-SIDE HAUL ROAD RUNOFF SYSTEM** | | | |
| **Upstream Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| TRM Condition | Good | | |
| Vegetation | Good | | |
| Drainage to 24" Culvert | Good | | |
| 24-Inch CMP Condition | Good | | |
| Discharge from Culvert | Good | | |
| Other | | | |
| **Middle Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Good | | |
| TRM Conditon | Good | | |
| Vegetation | Good | | |
| Riprap below Downdrain | Good | | |
| Other | | | |
| **Downdrain from Top** | | | |
| General Condition | Good | | |
| Cutoff Wall | Good | | |
| Erosion/Sedimentation | Good | | |
| Riprap Condition | Good | | |
| Other | | | |
| **Lower Area** | | | |
| General Condition | Good | | |
| Riprap Condition | Good | | |
| Concrete Cutoff Wall | Good | | |
| Erosion/Sedimentation | None observed | | |
| Cutoff Wall | Good | | |
| Grouted Riprap Chute | Good | | |
| Lower Cutoff Wall | Good | | |
| Concrete Apron Outfall | Good | | |
| Other | | | |

| **DISCHARGE CHANNEL FROM SOUTH-CENTRAL SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| TRM Condition | Good | | |
| Vegetative Growth | Good | | |
| Cutoff Wall | Good | | |
| Side Slopes | Good | | |
| Vegetation | Good | | |
| Grouted Riprap Chute | Good | | |
| Other | | | |

**Inspection Form 3**
**NTCRA East-Side Drainage Control Features**

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **EAST ENERGY DISSIPATION STRUCTURE AND DISCHARGE TO SADDLE BASIN** | | | |
| **East Energy Dissipation Structure** | | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Sedimentation | Significant accumulation | 5 | Needs to be cleared of sediment as part of regular O&M |
| Discharge Control | Good | | |
| Other | | | |
| **Ditch to Saddle Basin** | | | |
| General Condition | Good | | |
| TRM Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Vegetation | Good | | |
| Other | | | |

| **SOUTHEAST RUNOFF DITCH** | | | |
|---|---|---|---|
| General Condition | Good | | |
| Riprap Condition | Good | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Hillside Inflows | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetative Growth | Good | | |
| Other | | | |

| **DISCHARGE DITCH FROM EAST SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General Condition | Good | | |
| TRM Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetation | Good | | |
| Riprap Condition | Good | | |
| Other | | | |

## Inspection Form 4
## NTCRA West-Side Sedimentation/Detention Basins - Pipe Outlets and Spillways

| | |
|---|---|
| **DATE/TIME: Tuesday, June 11, 2019 9:30-1:30** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank** | **Sunny, Cool to warm** |

| **Location** | **Condition** | **Photo No.** | **Comments**<br>**Actions Needed or Taken** |
|---|---|---|---|
| **WEST-SIDE SOUTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | Minor | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None observed | | |
| Pipe Discharge | Good | | |
| Vegetation | Coming in | | |
| Other | | | |

| **WEST SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General condition | Good | | |
| Erosion | OK | | See below |
| Inflow Rock Diss. | Good | | |
| Water Depth | Estimated at 24 inches | | |
| Sedimentation | - | | |
| Rock Overflow | Good | | |
| Vegetation | Coming in | | |
| Access Road to West Sedimentation Pond | | 7 | Additional repairs needed.  Water bars need repair. |

| **NORTHWEST SEDIMENTATION/DETENTION BASIN** | | | |
|---|---|---|---|
| General condition | Good | | |
| Erosion At Edges | None observed | | |
| Embankments | Good | | |
| Inflow Riprap | Good | | |
| Internal Berm | Good | | |
| Grouted Riprap | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | minimal | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None observed | | |
| Pipe Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

## Inspection Form 5
## NTCRA East-Side Sedimentation/infiltration Basins - Pipe Outlets and Spillways

| | |
|---|---|
| **DATE/TIME: Tuesday, June 11, 2019 9:30-1:30** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank** | **Sunny, Cool to warm** |

| Location | Condition | Photo No. | Comments Actions Needed or Taken |
|---|---|---|---|
| **SOUTH-CENTRAL SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | Minor on one end | | |
| Sediment Depth | Minor | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None | | |
| Pipe Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SADDLE SEDIMENTATION/INFILTRATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody (1st Cell) | Good | | |
| Water Depth | 1 ' | | |
| Sediment Depth (1st Cell) | Not measured | | |
| Infiltration (2nd Cell) | 1 ' | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Vegetation | Coming in | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **EAST SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion At Edges | None observed | | |
| Embankments | Good | | |
| Inflow Riprap | Good | | |
| Internal Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | Some | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

## Inspection Form 6
## Dinwoody Borrow Area and Sedimentation Basins

| | |
|---|---|
| **DATE/TIME: Tuesday, June 11, 2019 9:30-1:30** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Ron Quinn, Lori Hamann, Art Burbank** | **Sunny, Cool to warm** |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **NORTH BORROW AREA** | | | |
| **Run-On Ditch To North** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Sedimentation/Debris | None observed | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Rock Discharge Apron | Good | | |
| Other | | | |
| **North Closure Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Thin | | |
| Runoff Swale Condition | Good | | |
| Slope Erosion Protection | Good | | |
| Fence | Good | | |
| **North Access Road** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH BORROW AREA** | | | |
| **Run-on Ditch to South** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Sedimentation/Debris | None observed | | |
| Vegetative growth (slopes and ditches) | Good | 8 | |
| TRM Condition | Good | | |
| Rock Discharge Apron | Good | | |
| Other | | | |
| **South Closure Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Runoff Swale Condition | Good | | |
| Slope Erosion Protection | Good | | |
| Fence | | | |
| **Access Road to South** | | | |
| General Condition | Pretty Good Some Gullies | | |
| Erosion/Sedimentation | Some | | |
| Other | | | |

## Inspection Form 6
## Dinwoody Borrow Area and Sedimentation Basins

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **NORTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Sedimentation in Basin | Good | | |
| Embankment | Good | | |
| Rock Inflow Protection | Good | | |
| Water in Basin | Approx 2.5 feet | | |
| Vegetation | Some Minor | | |
| Riprap Spillway | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Sedimentation in Basin | Good | | |
| Embankment | Good | | |
| Rock Inflow Protection | Good | | |
| Water in Basin | Approx 2 foot | 9 | |
| Vegetation | OK | | |
| Riprap Spillway | Good | | |
| Other | | | |

**<u>POLE CANYON COVER NTCRA INSPECTION PHOTO LOG – June 11, 2019</u>**

**WEST-SIDE COVER SYSTEM**

Upper West Side – Rilling and Slope Slump

West Energy Dissipation Structure Sediment in Basin

**EAST-SIDE COVER SYSTEM**

Wattles on South East Side

Upper East Side Slope Repair

East Energy Dissipation Feature

Upper East Side Topsoil and Seeded

North West Sediment Basin Road

**Fall Inspection**

**Pole Canyon 2013 NTRCRA**

**(November 14, 2019)**

## Inspection Form 1
## NTCRA Cover System and Access Roads

| DATE/TIME: Thursday, November 14, 2019 10:30-12:00 | WEATHER CONDITIONS/TEMPERATURE: |
|---|---|
| PERSONNEL: Jeff Hamilton, Art Burbank | Sunny, Cool to warm |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **WEST-SIDE COVER SYSTEM** | | | |
| **Upper West-Side** | | | |
| General Condition | Good | | |
| Erosion | Good | | |
| Vegetative Growth | OK | | |
| Wattle Conditon | OK | | |
| Rock Stability Buttresses | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Central Bench Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None | | |
| Gravel Surfacing | Good | | |
| Culvert to West EDS | Good | | |
| Rock Buttress Below | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Lower-West Side** | | | |
| Vegetative Growth | Good | | |
| Watttle Condition | Good | | |
| Pooling at Base | None | | |
| Silt Fence | Good | | |
| Runoff to Infil. Basin | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **South-Central Area** | | | |
| General Condition | Good | 1 | |
| Vegetative Growth | Good | | |
| Wattle Conditon | Good | | |
| Erosion | Good | | |
| Access from Haul Road | Good | | |
| Silt Fence | None | | |
| Other | | | |

| **EAST-SIDE COVER SYSTEM** | | | |
|---|---|---|---|
| **Top East Area** | | | |
| General Condition | Good | | |
| Pooling | Some Pooling | 6 | Need to connect pools so they drain. |
| East Runoff Berm | Good | | |
| Vegetative Growth (slopes and ditches) | Good | | |
| Erosion | Good | | |
| 24" Culvert at Access Rd. | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Blast Compound Area** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Access from Haul Road | Good | | |
| Security Fencing | Good | | |
| Other | | | |

## Inspection Form 1
## NTCRA Cover System and Access Roads

| Location | Condition | Photo No. | **Comments** Actions Needed or Taken |
|---|---|---|---|
| **EAST-SIDE COVER SYSTEM (continued)** | | | |
| **SW Side Slope** | | | |
| Stability | Good | | |
| Erosion | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Other | | | |
| **South East-Side Slope** | | | |
| General condition | Good | | |
| Wattle Conditions | Good | | |
| Access Rd. from South | Good | | |
| Erosion | OK | | |
| Vegetative Growth | OK | | |
| Slope Stability | Good | | |
| Other | | | |
| **South East Seep Zone** | | | |
| General Conditon | Good | | |
| Erosion | minor | | |
| Drainage of Seeps | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Area Stability | Good | | |
| Access Road | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |
| **Upper East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | Some rilling | 3,4 | Placement of Cedar Straws Completed |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| East-Face Runoff Ditch | Good | | |
| 36" CMP Culvert & Road | Good | | |
| Runoff Area to East EDS | Good | | |
| Other | | | |
| **Middle East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | OK | | Needs some Cedar Straws |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| Lower East Runoff Ditch | Good | | |
| Access Road | Good | | |
| Other | | | |
| **Lower East-Side Slope** | | | |
| General Condition | Good | | |
| Erosion | Good | | |
| Vegetative Growth | Good | | |
| Wattle Condition | Good | | |
| Large Rock Toe Zone | Good | | |
| Access Road | Good | | |
| Silt Fence | Good | | |
| Property / Livestock Fencing | Good | | |
| Other | | | |

**Inspection Form 2**
**NTCRA West-Side Drainage Control Features**

| | |
|---|---|
| **DATE/TIME: Thursday, November 14, 2019 10:30-12:00** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Art Burbank** | **Sunny, Cool to warm** |

| **Location** | **Condition** | **Photo No.** | **Comments**<br>**Actions Needed or Taken** |
|---|---|---|---|
| **PANEL A RUNOFF, INLET TO HAUL-ROAD CULVERT, CULVERT, AND UPPER WEST-SIDE RUNOFF** | | | |
| **Panel A Runoff and Inlet to 42-Inch Culvert** | | | |
| General Condition | OK | | |
| Erosion/Sedimentation | Good | | |
| Riprap in Channel | Good | | |
| Stability of Hillside | OK | | |
| Concrete Inlet Structure | Good; clear of sediment | | |
| Trash Rack Condition | Good | | |
| Debris at Inlet | Clear | | |
| Other | | | |
| **42-Inch CMP Culvert** | | | |
| General CMP Condition | Good | | |
| Sedimentation in CMP | Good | | |
| Stability of Cover | Good | | |
| Outlet Grouted Riprap | Good | | |
| Other | | | |
| **Runoff to West Energy Dissipation Structure (EDS)** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Good | | |
| Riprap in Channel | Good | | |
| Embankment Stability | Good | | |
| Ditch Curve Section | Good | | |
| Access along Channel | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **WEST ENERGY DISSIPATION STRUCTURE AND LOWER WEST-SIDE RUNOFF** | | | |
| **West Energy Dissipation Structure** | | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Sedimentation | Good | 2 | Cleaned Out |
| Ditch to Culvert | Good | | |
| Other | | | |
| **48-Inch CMP Culvert** | | | |
| General CMP Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Inlet/Outlet | Good | | |
| Cover Fill | Good | | |
| Other | | | |
| **Lower Runoff Ditch** | | | |
| General Conditon | Good | | |
| Stability (Access Road) | Good | | |
| Riprap Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Other | | | |
| **Outfall to West Sedimentation Basin** | | | |
| General Condition | Good | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Erosion | None observed | | |
| Other | | | |

## Inspection Form 2
## NTCRA West-Side Drainage Control Features

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **DISCHARGE FROM NW BASIN TO INFILTRATION BASIN** | | | |
| General Condition | Good | | |
| TRM Lining in Ditch | Good | | |
| Erosion | None observed | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap Chute | Good | | |
| Outfall into Infil. Basin | Good | | |
| Vegetation | Good | | |
| | | | |

| | | | |
|---|---|---|---|
| **SOUTH RUN-ON DITCHES** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Silt Fencing | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH WEST-SIDE RUNOFF SYSTEM** | | | |
| **South Runoff Ditch to West-Side South Sedimentation Basin** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Rock Riprap Stability | Good | | |
| Silt Fencing | - | | |
| Other | | | |
| **Discharge Ditch from West-Side South Basin** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Riprpap Conditon | Good | | |
| Grouted Riprap Outfall | Good | | |
| Other | | | |
| **36-Inch CMP South Haul Road Culvert** | | | |
| General CMP Condition | Good | | |
| Cover Fill | Good | | |
| Inlet/Outlet | Good | | |
| Riprap at Outlet | Good | | |
| Other | | | |

## Inspection Form 3
## NTCRA East-Side Drainage Control Features

| | |
|---|---|
| **DATE/TIME: Thursday, November 14, 2019 10:30-12:00** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Art Burbank** | **Sunny, Cool to warm** |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **EAST-SIDE HAUL ROAD RUNOFF SYSTEM** | | | |
| **Upstream Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| TRM Condition | Good | | |
| Vegetation | Good | | |
| Drainage to 24" Culvert | Good | | |
| 24-Inch CMP Condition | Good | | |
| Discharge from Culvert | Good | | |
| Other | | | |
| **Middle Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | Good | | |
| TRM Conditon | Good | | |
| Vegetation | Good | | |
| Riprap below Downdrain | Good | | |
| Other | | | |
| **Downdrain from Top** | | | |
| General Condition | Good | | |
| Cutoff Wall | Good | | |
| Erosion/Sedimentation | Good | | |
| Riprap Condition | Good | | |
| Other | | | |
| **Lower Area** | | | |
| General Condition | Good | | |
| Riprap Condition | Good | | |
| Concrete Cutoff Wall | Good | | |
| Erosion/Sedimentation | None observed | | |
| Cutoff Wall | Good | | |
| Grouted Riprap Chute | Good | | |
| Lower Cutoff Wall | Good | | |
| Concrete Apron Outfall | Good | | |
| Other | | | |

| **DISCHARGE CHANNEL FROM SOUTH-CENTRAL SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| TRM Condition | Good | | |
| Vegetative Growth | Good | | |
| Cutoff Wall | Good | | |
| Side Slopes | Good | | |
| Vegetation | Good | | |
| Grouted Riprap Chute | Good | | |
| Other | | | |

## Inspection Form 3
## NTCRA East-Side Drainage Control Features

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **EAST ENERGY DISSIPATION STRUCTURE AND DISCHARGE TO SADDLE BASIN** | | | |
| **East Energy Dissipation Structure** | | | |
| Concrete Cutoff Wall | Good | | |
| Grouted Riprap | Good | | |
| Sedimentation | Good | 5 | Cleaned Out |
| Discharge Control | Good | | |
| Other | | | |
| **Ditch to Saddle Basin** | | | |
| General Condition | Good | | |
| TRM Condition | Good | | |
| Erosion/Sedimentation | Minor | | |
| Vegetation | Good | | |
| Other | | | |

| **SOUTHEAST RUNOFF DITCH** | | | |
|---|---|---|---|
| General Condition | Good | | |
| Riprap Condition | Good | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Hillside Inflows | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetative Growth | Good | | |
| Other | | | |

| **DISCHARGE DITCH FROM EAST SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General Condition | Good | | |
| TRM Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Vegetation | Good | | |
| Riprap Condition | Good | | |
| Other | | | |

## Inspection Form 4
## NTCRA West-Side Sedimentation/Detention Basins - Pipe Outlets and Spillways

| | |
|---|---|
| **DATE/TIME: Thursday, November 14, 2019 10:30-12:00** | **WEATHER CONDITIONS/TEMPERATURE:** |
| **PERSONNEL: Jeff Hamilton, Art Burbank** | **Sunny, Cool to warm** |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **WEST-SIDE SOUTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | Minor | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None observed | | |
| Pipe Discharge | Good | | |
| Vegetation | Coming in | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **WEST SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | OK | | |
| Inflow Rock Diss. | Good | | |
| Water Depth | Covered with Snow and Ice | | |
| Sedimentation | - | | |
| Rock Overflow | Good | | |
| Vegetation | Coming in | | |
| Access Road to West Sedimentation Pond | | | |

| | | | |
|---|---|---|---|
| **NORTHWEST SEDIMENTATION/DETENTION BASIN** | | | |
| General condition | Good | | |
| Erosion At Edges | None observed | | |
| Embankments | Good | | |
| Inflow Riprap | Good | | |
| Internal Berm | Good | | |
| Grouted Riprap | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | minimal | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None observed | | |
| Pipe Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

 Form Date: February 2016

## Inspection Form 5
## NTCRA East-Side Sedimentation/infiltration Basins - Pipe Outlets and Spillways

| DATE/TIME: Thursday, November 14, 2019 10:30-12:00 | WEATHER CONDITIONS/TEMPERATURE: |
|---|---|
| PERSONNEL: Jeff Hamilton, Art Burbank | Sunny, Cool to warm |

| Location | Condition | Photo No. | **Comments** Actions Needed or Taken |
|---|---|---|---|
| **SOUTH-CENTRAL SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | Frozen | | |
| Sediment Depth | Minor | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Pipe Support & Trashrack | Good | | |
| Pipe Condition | Good | | |
| Pipe Clogging | None | | |
| Pipe Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

| **SADDLE SEDIMENTATION/INFILTRATION BASIN** | | | |
|---|---|---|---|
| General condition | Good | | |
| Erosion | None observed | | |
| Embankments | Good | | |
| Riprap Inflow | Good | | |
| Internal Rock Berm | Good | | |
| Dinwoody (1st Cell) | Good | | |
| Water Depth | 1 ' | | |
| Sediment Depth (1st Cell) | Not measured | | |
| Infiltration (2nd Cell) | 1 ' | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Vegetation | Coming in | | |
| Other | | | |

| **EAST SEDIMENTATION BASIN** | | | |
|---|---|---|---|
| General condition | Good | | |
| Erosion At Edges | None observed | | |
| Embankments | Good | | |
| Inflow Riprap | Good | | |
| Internal Berm | Good | | |
| Dinwoody Liner | Good | | |
| Water Depth | None observed | | |
| Sediment Depth | Some | | |
| Spillway Control | Good | | |
| Spillway Discharge | Good | | |
| Vegetation | Good | | |
| Other | | | |

## Inspection Form 6
## Dinwoody Borrow Area and Sedimentation Basins

| DATE/TIME: Thursday, November 14, 2019 10:30-12:00 | WEATHER CONDITIONS/TEMPERATURE: |
|---|---|
| PERSONNEL: Jeff Hamilton, Art Burbank | Sunny, Cool to warm |

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **NORTH BORROW AREA** | | | |
| **Run-On Ditch To North** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Sedimentation/Debris | None observed | | |
| Vegetative Growth | Good | | |
| TRM Condition | Good | | |
| Rock Discharge Apron | Good | | |
| Other | | | |
| **North Closure Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Thin | | |
| Runoff Swale Condition | Good | | |
| Slope Erosion Protection | Good | | |
| Fence | Good | | |
| **North Access Road** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH BORROW AREA** | | | |
| **Run-on Ditch to South** | | | |
| General Condition | Good | | |
| Erosion | None observed | | |
| Sedimentation/Debris | None observed | | |
| Vegetative growth (slopes and ditches) | Good | | |
| TRM Condition | Good | | |
| Rock Discharge Apron | Good | | |
| Other | | | |
| **South Closure Area** | | | |
| General Condition | Good | | |
| Erosion/Sedimentation | None observed | | |
| Wattle Conditions | Good | | |
| Vegetative Growth | Good | | |
| Runoff Swale Condition | Good | | |
| Slope Erosion Protection | Good | | |
| Fence | | | |
| **Access Road to South** | | | |
| General Condition | Pretty Good Some Gullies | | |
| Erosion/Sedimentation | Some | | |
| Other | | | |

**Inspection Form 6**
**Dinwoody Borrow Area and Sedimentation Basins**

| Location | Condition | Photo No. | Comments<br>Actions Needed or Taken |
|---|---|---|---|
| **NORTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Sedimentation in Basin | Good | | |
| Embankment | Good | | |
| Rock Inflow Protection | Good | | |
| Water in Basin | Frozen over | | |
| Vegetation | Some Minor | | |
| Riprap Spillway | Good | | |
| Other | | | |

| | | | |
|---|---|---|---|
| **SOUTH SEDIMENTATION BASIN** | | | |
| General condition | Good | | |
| Erosion | None observed | | |
| Sedimentation in Basin | Good | | |
| Embankment | Good | | |
| Rock Inflow Protection | Good | | |
| Water in Basin | Frozen over | | |
| Vegetation | OK | | |
| Riprap Spillway | Good | | |
| Other | | | |

**POLE CANYON COVER NTCRA INSPECTION PHOTO LOG – November 14, 2019**

**WEST-SIDE COVER SYSTEM**

Photo 1: West Side South Central – Riling and Slope Slump

Photo 2: West Energy Dissipation Structure Sediment in Basin Clean Out

**EAST-SIDE COVER SYSTEM**

Photo 3: Cedar Straw Installation South East Side

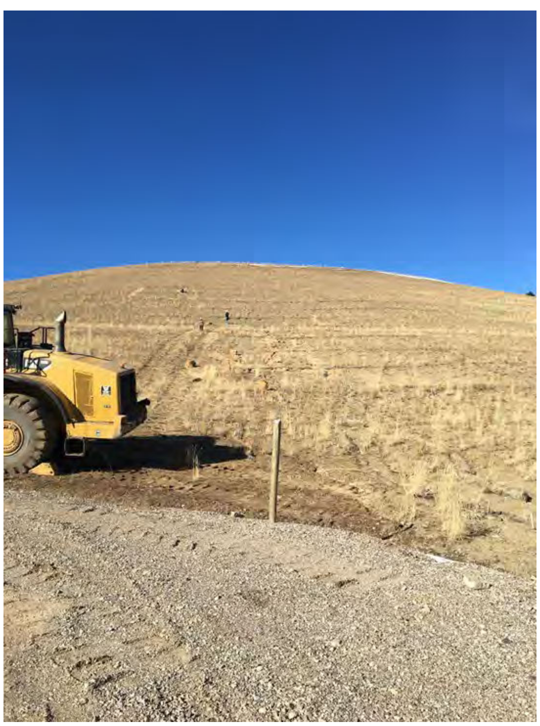


Photo 4: Upper East Side Slope Repair

Photo 5: East Energy Dissipation Feature Cleaned Out

Photo 6: Upper East Side Pooling

# APPENDIX B

## Analysis of Continuous Flow Measurements

# APPENDIX B

# ANALYSIS OF CONTINUOUS FLOW MEASUREMENTS

This appendix presents the methodologies for collection of continuous flow data in the area of the Pole Canyon overburden disposal area (ODA). Two flumes and two weirs have been permanently installed to continuously collect flow data in this area (Figure B-1). The flumes are located upstream of the infiltration basin (station UP-IN) and immediately downstream from the ODA toe seep (LP-1). The weirs are located at the pipeline inlet (UP-PD) and pipeline outlet (LP-PD).

## B.1 Flumes

Flumes were installed upstream from the infiltration basin (station UP-IN) and immediately downstream from the ODA toe (LP-1) in early 2009 (Figure B-1). A 12-inch Parshall flume is installed at station UP-IN that is capable of accurately measuring flow in the range of 0.12 cubic feet per second (cfs) to 16.13 cfs. A 3-inch Parshall flume is installed at station LP-1 that is capable of accurately measuring flow in the range of 0.028 cfs to 1.86 cfs. Both flumes are made of fiberglass and are outfitted with pressure transducers and data loggers to record the water levels in the flumes on 15-minute intervals. The water level within each flume can be converted to flow using empirical equations. The empirical equation used to calculate flow through the flumes is presented in the *Handbook on Weirs and Flumes* (USBR 2001):

$$Q = 4h^{1.522} \text{ (12-inch Parshall flume equation)}$$

$$Q = 0.992h^{1.55} \text{ (3-inch Parshall flume weir equation)}$$

Where:

Q = discharge (cfs)

h = head on the weir (feet)

Calibration measurements are made at UP-IN and LP-1 during the sampling events to correct for transducer drift and to ensure that the transducers are operating properly.

## B.2 Weirs

Permanent weirs were installed in 2009 within the bypass pipeline inlet structure (UP-PD) and outlet structure (LP-PD) to monitor flow entering and exiting the pipeline (see locations on Figure B-1). These weirs were installed to provide flow data to help identify if the pipeline may be leaking. A combination weir (v-notch and rectangular) was installed within the inlet structure while a conventional v-notch weir was installed within the outlet structure. Both weirs are made of stainless steel and are equipped with pressure transducers and data loggers to record the water level behind the weir, which can be converted to flow using calibrated empirical equations.

The empirical equation used to calculate flow through the outlet structure v-notch weir is presented in the *Handbook on Weirs and Flumes* (USBR 2001):

$$Q = 2.49h^{2.48}$$ (90-degree v-notch weir equation)

Where:

Q = discharge (cfs)

h = head on the weir (feet)

There are no standard equations for the type of combination weir at UP-PD. Therefore, during the first full year of weir operation in 2010, the flow measured at the outlet structure was used to better calibrate the weir equation coefficients used in the inlet structure combination weir equation. The corrected combination weir equation for water levels up to 3 inches (0.25 feet; the height of the v-notches in the combination weir) is shown below:

$$Q = 7.8 * 2.47301 * (h + 0.002903)^{2.51}$$ (when h <= 0.25 feet)

Where:

Q = discharge (cfs)

h = head on the weir (feet)

When the head on the inlet structure weir is greater than 3 inches (0.25 feet), the following corrected combination weir equation is used:

$$Q = 0.61198 + 26.64 * (h - 0.25)^{1\ 345}$$ (when h > 0.25 feet)

Calibration measurements are made at LP-PD and UP-PD during the sampling events to correct for transducer drift and to ensure that the transducers are operating properly.

## B.3 Pipeline Control Chart

Control charts are a useful, graphical method of monitoring the performance of equipment and instrumentation. This type of chart can be used to track the performance over time and can give operators a quick and easy way to determine if the equipment is performing as expected. Control charts can also be used as an early indicator to identify if the equipment performance is deviating from an acceptable range before the equipment has completely failed. For the Pole Canyon Creek bypass pipeline, control charts are useful to monitor flow entering and exiting the pipeline over time to determine if a leak could be developing. If the control chart indicates that there may be an emerging leak, then more extensive leak detection methods may be employed.

Comparisons of the flow rates between the inlet structure (UP-PD) and outlet structure (LP-PD) and cumulative flow volume for the water year are shown in Figure B-2. A chart showing the relative difference of annual cumulative volume of flow since flow monitoring was initiated in late 2009 is also shown in Figure B-2.

In order to construct the flow control chart (Figure B-2) for the period of record, the following steps were followed: (1) instantaneous flows were measured at both the inlet and outlet structure weirs on a 15-minute interval; (2) the instantaneous flows were used to calculate daily average flows; (3) the daily average flows were used to calculate daily flow volumes (in acre-feet); and (4) the daily flow volumes were summed over time for both the inlet and the outlet flows. The cumulative difference in flow was then plotted over time on the control chart. If a leak was developing, the control chart would show a negative slope (downward) over time. As shown in Figure B-2 comparisons of cumulative flow volume at the pipeline inlet and outlet show small variations in flow since monitoring was initiated in late 2009. This long-term information confirms the pipeline is operating as designed.

Only a limited amount of data is available for the pipeline inlet (UP-PD) to review in the 2019 control chart (Figure B-2). As discussed in the text, the inlet transducer began icing up in November 2019. The transducer at UP-PD became damaged due to the ice buildup and flow data are not available until the transducer was replaced on July 16, 2019.

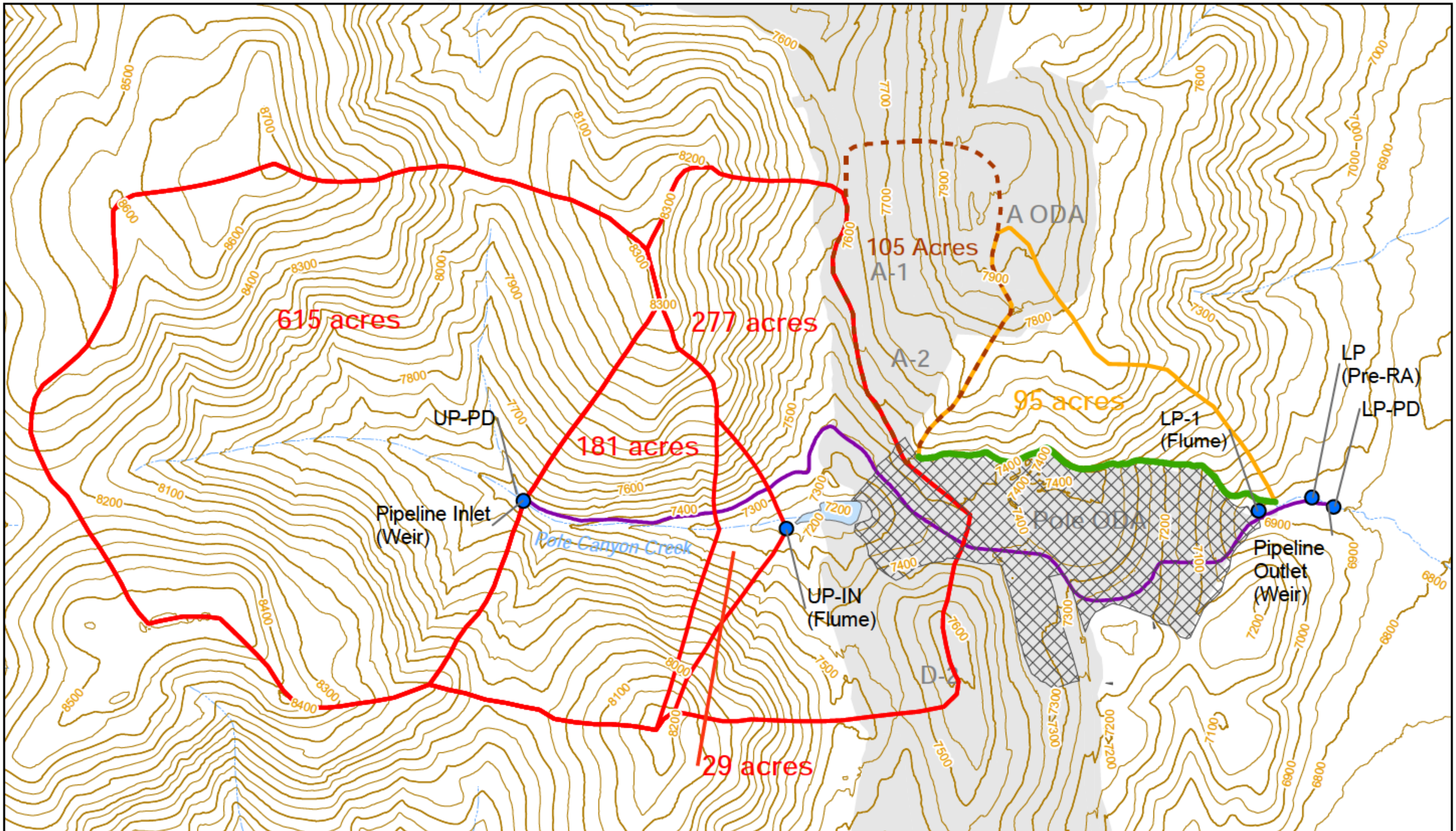
Review of the 2019 control chart (Figure B-2) (where there is overlapping flow data) shows a negative slope with a slight downward trend. Although a negative slope may be indicative of leakage from the pipeline, there are no other indicators (settling or ponding above the pipeline) that suggest the pipeline is leaking. This trend is likely due to small but consistent differences between flows measured at UP-PD and LP-PD. Flows measured at the pipeline inlet (UP-PD) during the period of overlapping data were slightly higher than those measured at the pipeline outlet (LP-PD). This difference may be due to lack of precision in low flow measurements at the UP-PD combination weir and/or transducer instrument drift or noise. Based on the total flow measured at the pipeline outlet, about 84 percent of the total flow through the pipeline had already occurred before the inlet transducer was replace on July 16, 2019. Furthermore, manual stage readings at the inlet and outlet weirs confirmed that flow at the pipeline inlet and outlet are equal. To monitor this, ongoing evaluation of flow monitoring data is underway at these locations with correction to flow measurements possible based on new information.

## B.4 Reference

United States Department of the Interior, Bureau of Reclamation (USBR). 2001. Water Measurement Manual. A Water Resources Technical Publication.

# FIGURES

S:\GIS\ARCPRJ2\010109\PLT\EFFECTIVENESSMONPLAN\2019ANNRPT\FIGB_1_POLEFLOWLOCS.MXD




## Legend

- Flume and Weir Locations
- Drainage Area for Runoff from Panel A Reclaimed Area
- Pole Canyon ODA 2013 NTCRA Cover Area
- Upper Pole Canyon Creek Watershed
- Run-on Control Channel Watershed
- Bypass Pipeline (2006 NTCRA)
- Run-on Control Channel (2006 NTCRA)
- Sedimentation/Infiltration Basin (2006 NTCRA)
- Mine Disturbance Areas

NTCRA = Non-Time-Critical Removal Action

N

0 1,000 2,000

Feet

**J.R. SIMPLOT COMPANY**

SMOKY CANYON M NE

2019 PERFORMANCE AND EFFECTIVENESS MONITOR NG REPORT

FIGURE B-1

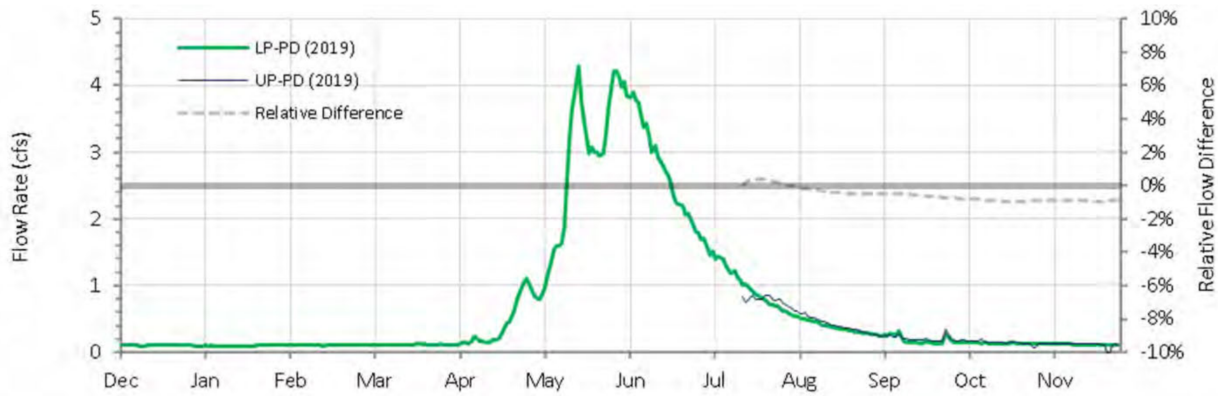
**UPPER POLE CANYON CREEK WATERSHED AND NTCRA COMPONENTS**

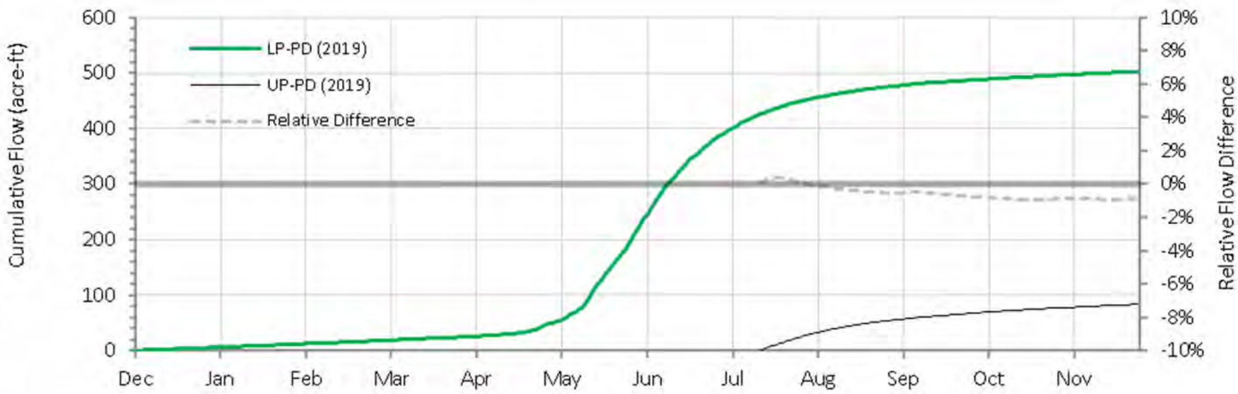
DATE: JUN 17, 2020

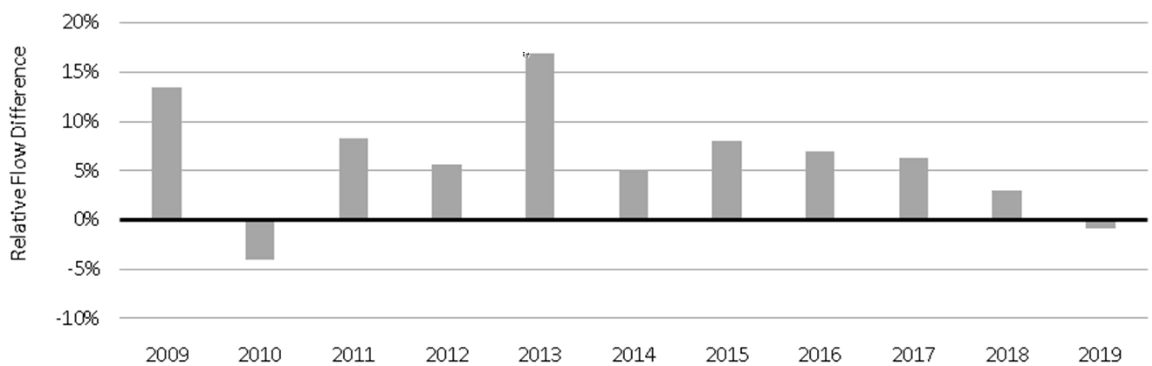
BY: WSB

FOR: LJM

FORMATION ENVIRONMENTAL




Notes:

1. Relative flow difference is based on total volume discharged over the year, as measured at the LP-PD weir. A positive difference indicates more water was calculated discharging from the pipeline than entering at the inlet.
2. Flow data from the pipeline inlet (UP-PD) is unavailable from December 2018 unit July 16, 2019. The inlet transducer began icing up in early November 2018 and was damaged, resulting in the transducer recording erroneous data. The inlet transducer was replaced as conditions allowed on July 16..
3. Cumulative flow difference calculated for period when transducers at both LP-PD and UP-PD were operational.

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2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE B-2

**BYPASS PIPELINE INFLOW/OUTFLOW COMPARISON**

| | |
|---|---|
| DATE: JULY 2020 | |
| BY: LJM | FOR: ACK |

FORMATION ENVIRONMENTAL

# APPENDIX C

## 2004–2019 Flow, Water Quality, Groundwater Level, and Vegetation Monitoring Data (on CD only)

# APPENDIX D

## Statistical Evaluation of Monitoring Data

## APPENDIX D

## STATISTICAL EVALUATION OF MONITORING DATA

The Pole Canyon Non-Time-Critical Removal Action Environmental Monitoring Plan Revision No. 5 (EMP Rev 5) (Formation 2018) specifies that selenium concentrations at key monitoring locations will be evaluated using statistical methods. The purpose of the statistical evaluation is to confirm the effectiveness of the 2006 Water Management Non-Time-Critical Removal Action (2006 NTCRA) in reducing selenium transport from the Pole Canyon overburden disposal area (ODA) to surface water and groundwater flow pathways. A second NTCRA, the Pole Canyon Dinwoody/Chert Cover NTCRA (2013 NTCRA), was implemented to address infiltration into the ODA from direct precipitation and snowmelt.

The anticipated effects of the 2006 NTCRA are reductions in transport of selenium from the Pole Canyon ODA to downstream surface water and to downgradient groundwater in both the alluvial aquifer in Sage Valley and in the Wells Formation aquifer. The statistical evaluation of surface water and groundwater monitoring data is intended to confirm when such reductions have taken place.

The statistical evaluation is based on observed selenium concentrations in surface water and groundwater samples collected at key monitoring locations downstream and downgradient of the ODA. Due to the dynamic nature of infiltration conditions in portions of the mine and the resultant potential for variable selenium contributions over time from these dynamic source areas to groundwater and surface water flow systems, decision-making regarding the effectiveness of the Pole Canyon NTCRA relies on data collected at monitoring locations not influenced by selenium from sources other than the Pole Canyon ODA.

Those locations are: (1) alluvial and Wells Formation groundwater monitoring locations that are downgradient of the Pole Canyon ODA but upgradient of potential transport pathways from ongoing source areas, which include alluvial monitoring wells GW-15 and GW-22 (two sample depths) and Wells Formation monitoring well GW-16 and (2) surface water monitoring stations that are downstream of the Pole Canyon ODA but upstream of potential transport pathways from other sources, which include the pre–NTCRA lower Pole Canyon Creek station LP and post–NTCRA station LP-PD, North Fork Sage Creek station NSV-6, and Sage Creek station LSV-1 upstream of the inflow from the Hoopes Spring complex.

The decision rules specified in EMP Rev 5 (Formation 2018) for evaluating the effectiveness of the 2006 NTCRA in reducing selenium transport to surface water or groundwater have the following general form:

- If after implementation of the NTCRA selenium concentrations and mass loads in lower Pole Canyon Creek water either increase or remain the same as pre-NTCRA concentrations and mass loads, then the Removal Action does not reduce surface water transport of selenium from the ODA to lower Pole Canyon Creek or to northern Sage Valley. Alternatively, if the selenium concentrations and mass loads decrease in downstream creek water, then the NTCRA is effective at reducing transport to surface water in lower Pole Canyon and northern Sage Valley.

- If after implementation of the NTCRA selenium concentrations in downgradient groundwater either increase or remain the same compared to pre-NTCRA concentrations, then the NTCRA does not reduce selenium transport from the ODA to groundwater. Alternatively, if the selenium concentrations decrease in downgradient groundwater, then the NTCRA is effective at reducing transport to groundwater.

The Administrative Settlement Agreement and Order on Consent/Consent Order (ASAOC) Statement of Work (SOW) for the Pole Canyon NTCRA sets forth specific performance standards for work performed to implement the 2006 NTCRA (refer to Section 2.4 of the 2006 ASAOC SOW; U.S. Department of Agriculture Forest Service [USFS], U.S. Environmental Protection Agency [USEPA], and Idaho Department of Environmental Quality [IDEQ] 2006). A separate ASAOC entered into by the USFS, IDEQ, the Shoshone-Bannock Tribes (Tribes), and Simplot (USFS, IDEQ, and Tribes 2013) sets forth performance standards for work performed to implement the 2013 NTCRA. Neither of the SOW performance standards include specific, quantitative reductions in selenium concentrations or selenium mass loads associated with transport pathways from the Pole Canyon ODA.

If there is no change or an increase in selenium transport from the Pole Canyon ODA following implementation of the 2006 NTCRA, then effectiveness of the NTCRA has not been demonstrated and additional actions may be needed to limit transport of selenium from the Pole Canyon ODA to groundwater and surface water. If selenium transport decreases following implementation of the 2006 NTCRA, then the effectiveness of the NTCRA will be demonstrated, and the need for additional actions will ultimately depend on the magnitude of that decrease relative to final Remedial Action Objectives developed through the ongoing Remedial Investigation/Feasibility Study (RI/FS) process at the Smoky Canyon Mine.

The evaluation of the surface water and groundwater pathways in 2019, as covered in this statistical evaluation, includes effects of both NTCRAs by default, because the effects of the Water Management and Dinwoody/Chert cover system NTCRAs cannot be separated.

## D.1 Statistical Evaluation of Monitoring Data

The key monitoring locations for statistical evaluation are GW-15 and GW-22 for alluvial groundwater; GW-16 for Wells Formation groundwater; and LP/LP-PD, NSV-6, and LSV-1 for surface water. Statistical evaluation of pre- and post-NTCRA monitoring data from these locations was performed in general accordance with the procedures described in EMP Rev 5 (Formation 2018). However, comparison of pre- and post-NTCRA data was not possible for GW-22 as the majority of the samples were collected after completion of the 2006 NTCRA; therefore, the statistical analysis for this location focused only on changes in concentration since completion of the 2006 NTCRA.

Data for statistical evaluation were compiled from monitoring records dating from 2000 through 2019. The pre-NTCRA monitoring data were collected from May 2000 through September 2007 (diversion of Pole Canyon Creek was completed in late September 2007; other elements of the NTCRA were not completed until the end of 2008). The post-NTCRA monitoring data were collected from October 2007 through November 2019. Selenium concentrations vary seasonally at many of the key monitoring locations. To address seasonal effects, data from each location were split into two separate groups that represent two general seasons with distinct precipitation, runoff, and surface flow conditions: (1) Fall-Winter (September through March) and (2) Spring-Summer (April through August). In general, the months of September through March are characterized by relatively cool conditions, low potential for storms generating surface runoff, and low surface water flows; these are categorized as fall-winter months. The months of April through August have higher surface water flows associated with spring snowmelt and summer storm events that result in surface runoff, or a combination of both; these are categorized as spring-summer months.

The resultant seasonal data set compiled for each monitoring location is presented in Table D-1. Samples collected at monitoring locations GW-15, LP-PD, NSV-6, and LSV-1 from June 14 and 15, 2011 were collected at a time when the creek bypass pipeline was not functioning as designed; the results associated with these samples are not considered representative of typical post-NTCRA conditions and, therefore, have been excluded from statistical comparison tests.

Whenever sufficient data were available, the statistical tests were performed separately for each seasonal data set from each location. Statistical outlier testing was performed on post-NTCRA data sets large enough for outlier testing (i.e., $n \geq 8$) using the Dixon outlier test at the 99 percent confidence level ($\alpha = 0.01$). The high confidence level was selected to address concerns reflected in the USEPA guidance regarding removal of outlier values from data sets used for statistically-based monitoring programs (USEPA 2009). Unusual, and possibly discrepant, values can occur in a monitoring data set for many reasons, including (1) an actual contaminant release that significantly impacts measurements, (2) accurate/true but extreme background groundwater measurements, (3) inconsistent sampling or analytical chemistry methodology resulting in laboratory contamination or other anomalies; and (4) errors in the transcription of data values or decimal points (USEPA 2009). Outlier values explained by reasons 3 and 4 are inaccurate measurements that should be removed from data sets used in statistical analyses. Although removal of outliers may be appropriate even if no probable error or discrepancy can be firmly identified, current USEPA (2009) guidance cautions that statistical outliers should not be treated as such until a specific reason for inaccuracy (e.g., erroneous result or non-representative measurement) can be determined. Valid reasons for removal of outlier values might include contaminated sampling equipment, laboratory contamination of the sample, errors in transcription of the data values, etc.

The results of the outlier testing are summarized below in Table D-2. Only upper tail outliers were identified. No evidence has been found (inconsistent sampling or analytical laboratory errors, etc.) to warrant the removal of these outliers.

**Table D-2. Results of Outlier Testing**

| Monitoring Location | Sample Date | Selenium Concentration (mg/L) | Decision |
|---|---|---|---|
| GW-16 | 9/10/2008 | 1.27 | Not Removed |
| LP-PD | 9/12/2015 | 0.0014 | |
| LP-PD | 5/19/2008 | 0.0409 | |
| LSV-1 | 9/17/2008 | 0.0014 | |
| LSV-1 | 5/20/2013 | 0.0041 | |

For each key monitoring location, one of two types of tests was performed: a two-sample comparison test or a test for trend. The criteria for performing either of these tests and the procedures for implementing them are described below. Two-sample comparison tests were performed when a minimum of five independent results were available for both pre-NTCRA and post-NTCRA time periods at the tested location. For all other data sets, a test for trend was applied to evaluate changes in selenium concentrations (or mass loads) over time.

Each seasonal data set was first tested for normality to determine the data distribution type and allow for selection of an appropriate comparison test procedure (parametric vs. non-parametric). The Shapiro-Wilk test for normality was performed at the 95 percent confidence level ($\alpha$ = 0.05).[1] If both the pre-NTCRA and post-NTCRA data sets were normally or lognormally distributed, a parametric comparison test (a one-sided t test[2]) could be performed at the 90 percent confidence level ($\alpha$ = 0.10). When either the pre-NTCRA or post-NTCRA data set was not normally or lognormally distributed, a non-parametric comparison test (the Wilcoxon rank-

[1] Refer to USEPA Unified Guidance (USEPA 2009) for specific details regarding the Shapiro-Wilk test for normality, Section 10.5.

[2] USEPA Unified Guidance (USEPA 2009), Section 16.1.

sum test[3]) was more suitable and performed at the 90 percent confidence level. For most of the two-sample data sets to be tested, either one or both were not normally distributed. For this reason, the Wilcoxon rank-sum test was used to complete all of the two-sample comparison tests. The results of the normality and comparison tests are reported for each data set in Table D-3. If the comparison test result indicated that selenium concentrations were lower in the post-NTCRA data set than in the pre-NTCRA data set, then the NTCRA is effective in reducing selenium concentrations at the specified monitoring location.

Tests for trends were performed instead of the two-sample comparison tests when pre-NTCRA data were either not available (e.g., at monitoring well GW-22, only one sample was collected before the 2006 NTCRA was implemented) or were too limited (<5 samples) to allow for use of a comparison test at an acceptable confidence level. A non-parametric test for trend, Sen's slope estimator, was performed for each seasonal data set using all available data (years 2000 through 2019; pre- and post-NTCRA) from the monitoring location of interest. The test was performed as a one-sided test for downward trend (decreasing concentrations over time) at the 90 percent confidence level. Sen's test was selected over a linear regression method for trend testing because most of the data did not conform to the distributional assumptions that must be met for linear regression analysis. Sen's test is a simple, non-parametric procedure that allows for an estimate of the slope for selenium concentrations over time. A positive slope estimate indicates increasing concentrations over time, and a negative slope estimate indicates decreasing concentrations over time. With sufficient data, the test also provides a confidence interval for the slope estimate so that the slope can be estimated at a target 90 percent confidence level.

The variance of the selenium concentration data over time and the presence of potential outlier values in the individually tested data were also evaluated and considered in interpretation of the test results. For each of the key monitoring locations, a time-series plot of total selenium concentrations measured from 2000 through 2019 was prepared as a visual reference for interpretation of the test results. The individual time-series plots are included at the end of this appendix.

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[3] USEPA Unified Guidance (USEPA 2009), Section 16.2.

### D.1.1 Results of Statistical Tests for Selenium Concentrations

Data sets compiled to test for differences between the pre- and post-NTCRA selenium concentrations at each location are presented in Table D-1. As previously described, two sets (Spring-Summer and Fall-Winter) of paired data were compiled for each of the key monitoring locations to represent pre-NTCRA and post-NTCRA conditions (in reference to the 2006 NTCRA). The number of measurement values and the mean and standard deviations for each separate data set are reported in Table D-3 along with a description of the appropriate type of comparison test performed for each paired data set. The results of the comparison tests are also reported.

Statistically significant changes in selenium concentrations, relative to completion of the 2006 NTCRA, were observed at the locations identified in Table D-4.

At the other locations and seasonal time-periods, either the selenium concentrations remained unchanged, or no statistically significant differences in the pre- and post-NTCRA selenium concentrations were confirmed at the target 90 percent confidence level. Ongoing monitoring will provide the additional data to confirm statistically significant changes in selenium concentrations at the effectiveness monitoring locations.

**Table D-4. Statistically Significant Changes in Selenium Concentrations in 2019.**

| Monitoring Location | Season | Conclusion Based on Statistical Evaluation (at desired level of confidence) |
|---|---|---|
| Alluvial groundwater GW-15 | Fall-Winter | Selenium concentration decreased after implementation of 2006 NTCRA. |
| | Spring-Summer [a] | |
| Wells Formation groundwater GW-16 | Fall-Winter | Selenium concentration increased after implementation of 2006 NTCRA. [c] |
| | Spring-Summer | |
| Lower Pole Canyon Creek LP/LP-PD [b] | Spring-Summer [a] | Selenium concentration decreased after implementation of 2006 NTCRA. |
| North Fork of Sage Creek NSV-6 [b] | Fall-Winter | Selenium concentrations decreasing over time. |
| | Spring-Summer [a] | Selenium concentration increased after implementation of 2006 NTCRA. [d] |
| Sage Creek above Hoopes Spring LSV-1 [b] | Fall-Winter | Selenium concentrations decreasing over time. |
| | Spring-Summer [a] | Selenium concentration decreased after implementation of 2006 NTCRA. |

Notes:

[a] The selenium results for the GW-15, LP-PD, NSV-6, and LSV-1 samples collected on June 14-15, 2011 were not included in the data used for statistical analysis because the samples were collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the results are not considered representative of typical post-NTCRA conditions.

[b] Note that some of the source data for location LP-PD, NSV-6, and LSV-1 are estimated values because selenium concentrations were less than the Practical Quantitation Limit (PQL). Therefore, the results of the statistical tests at these locations are less certain than for locations with values reported above the PQL.

[c] Although the results of the statistical analysis suggest that selenium concentrations have increased since implementation of the 2006 NTCRA, the time series plot for GW-16 shows that selenium concentrations in groundwater at GW-16 have decreased since implementation of the 2013 NTCRA.

[d] Although the results of the statistical analysis suggest that spring-summer selenium concentrations have increased since implementation of the 2006 NTCRA, the time series plot for NSV-6 shows that spring-summer selenium concentrations in surface water at NSV-6 have decreased since implementation of the 2013 NTCRA.

D.1.2 Results of Statistical Tests for Selenium Mass Loads

The same type of statistical analysis was planned using calculated selenium mass-load results from key surface water monitoring locations on lower Pole Canyon Creek (LP/LP-PD), North Fork Sage Creek (NSV-6), and Sage Creek above Hoopes Spring (LSV-1). As for the selenium concentration data, two sets (Spring-Summer and Fall-Winter seasonal data) of paired data (pre-NTCRA and post-NTCRA) were compiled for each of these three locations.

The selenium mass-load data compiled for this effort are provided in Tables D-5 through D-7. The data include the measured selenium concentration and flow and the calculated selenium mass load for each sampling event for which both concentration and flow data were available. When the pre-NTCRA and post-NTCRA flow data were assembled for these three locations, it became apparent that flows measured in pre-NTCRA years (primarily 2002, 2003, and 2004) were not comparable to the flows measured at the same locations in post-NTCRA years (since late 2007) due to the effects of regional drought conditions that existed from approximately 2000 through 2005. This effect is evident in the Spring-Summer (i.e., high-flow) data but not as clear in the Fall-Winter (i.e., low-flow) data. As a result, the Spring-Summer flows measured in the pre-NTCRA years are consistently lower than in the post-NTCRA years. For this reason, selenium mass loads computed using flows from drought years are not comparable to selenium mass loads computed using more typical, non-drought flows measured at the same locations in recent years.

The planned statistical testing was not applied to the Spring-Summer selenium mass load data because the pre- and post-NTCRA seasonal data do not represent comparable surface water flow conditions, as needed to specifically assess the effectiveness of the 2006 NTCRA for limiting the selenium mass loads in surface water. However, the Fall-Winter selenium mass load data were tested.

Sen’s slope estimator was the trend test applied to the post-NTRCA Fall-Winter mass load data from LP/LP-PD (lower Pole Canyon Creek), NSV-6, and LSV-1. For NSV-6, a statistically significant decreasing trend was detected at the 90 percent confidence level (note: no selenium mass load data are available for location NSV-6 from 2011 thru 2014 or in November 2019 due to frozen conditions preventing the measurement of flow). For LP/LP-PD and LSV-1, neither increasing nor decreasing trends in selenium mass loads were demonstrated at the 90 percent confidence level. Additional data are needed to confirm changes in selenium mass loads at these locations.

## D.2 References

Formation Environmental, LLC (Formation). 2018. Revision No. 5 Pole Canyon Non-Time-Critical Removal Action Effectiveness Monitoring Plan. Prepared for J.R. Simplot Company, March 2018.

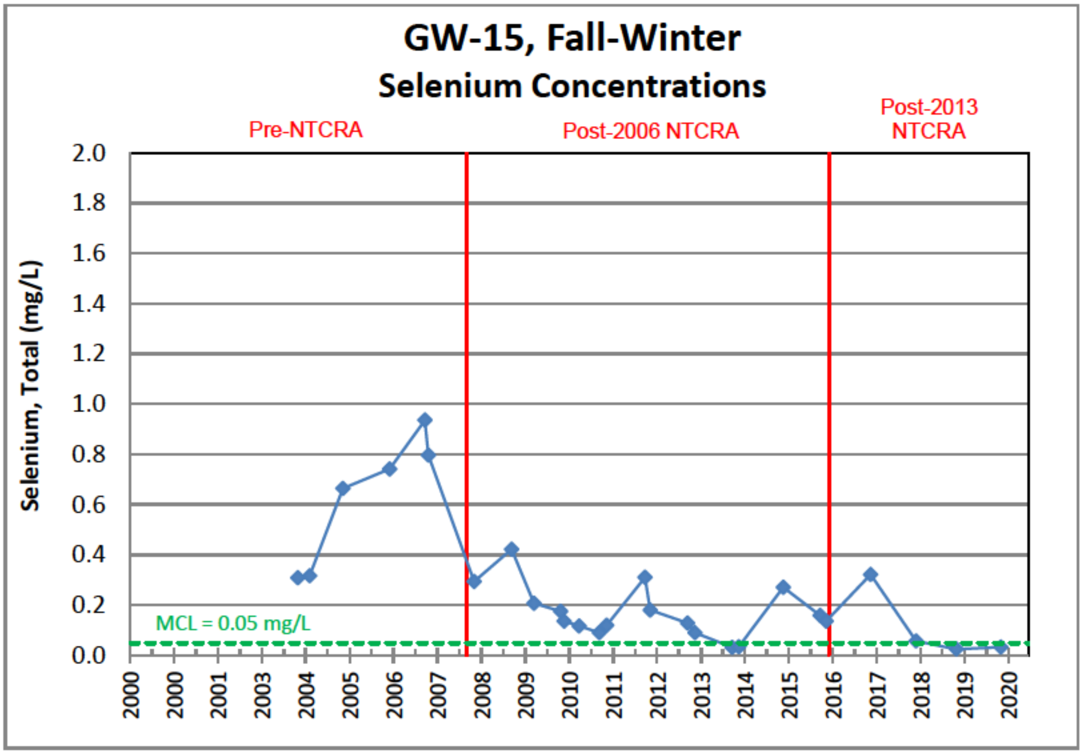
United States Department of Agriculture, Forest Service Region 4, US Environmental Protection Agency Region 10, Idaho Department of Environmental Quality (USFS, USEPA, and IDEQ). 2006. Administrative Settlement Agreement and Order on Consent/Consent Order for Non-Time-Critical Removal Action, Smoky Canyon Phosphate Mine, J.R. Simplot Company Respondent. Signed October 2, 2006.

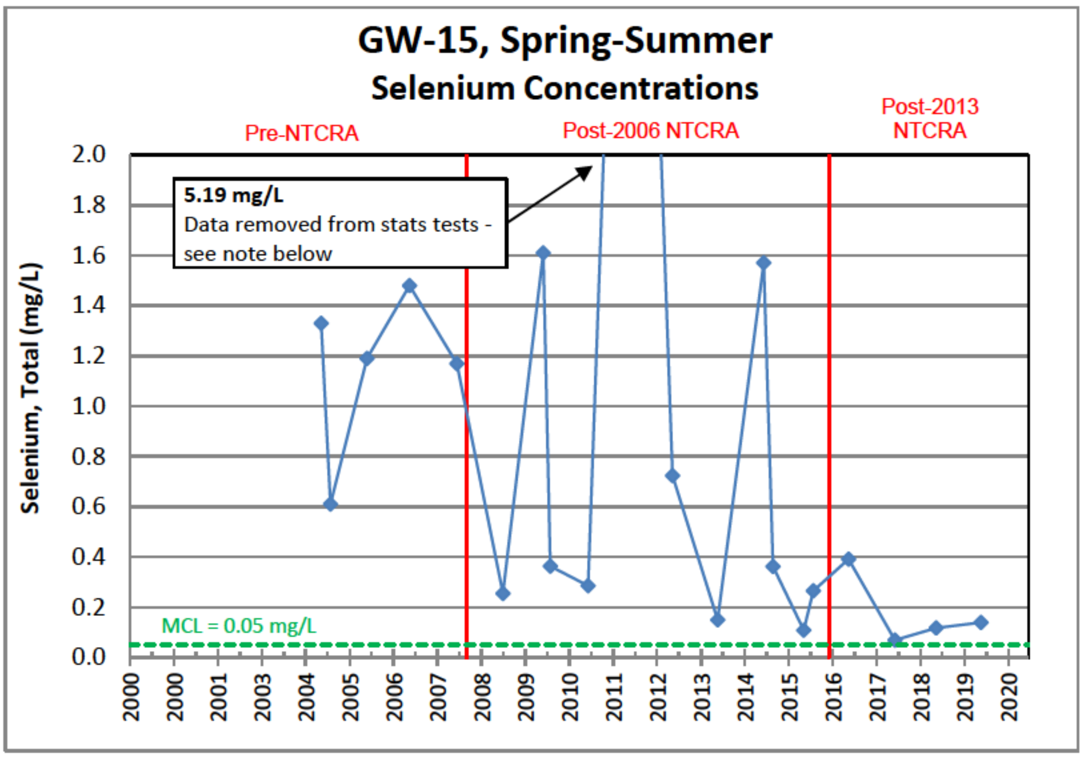
United States Department of Agriculture, Forest Service Region 4, Idaho Department of Environmental Quality, Shoshone-Bannock Tribes (USFS, IDEQ, and Tribes). 2013. Administrative Settlement Agreement and Order on Consent/Consent Order for Non-Time-Critical Removal Action, Smoky Canyon Phosphate Mine. J.R. Simplot Company Respondent. Signed November 27, 2013.

United States Environmental Protection Agency (USEPA). 2006. Guidance for the Data Quality Objectives Process, EPA QA/G-4, Office of Environmental Information, EPA/240/B-06/001.

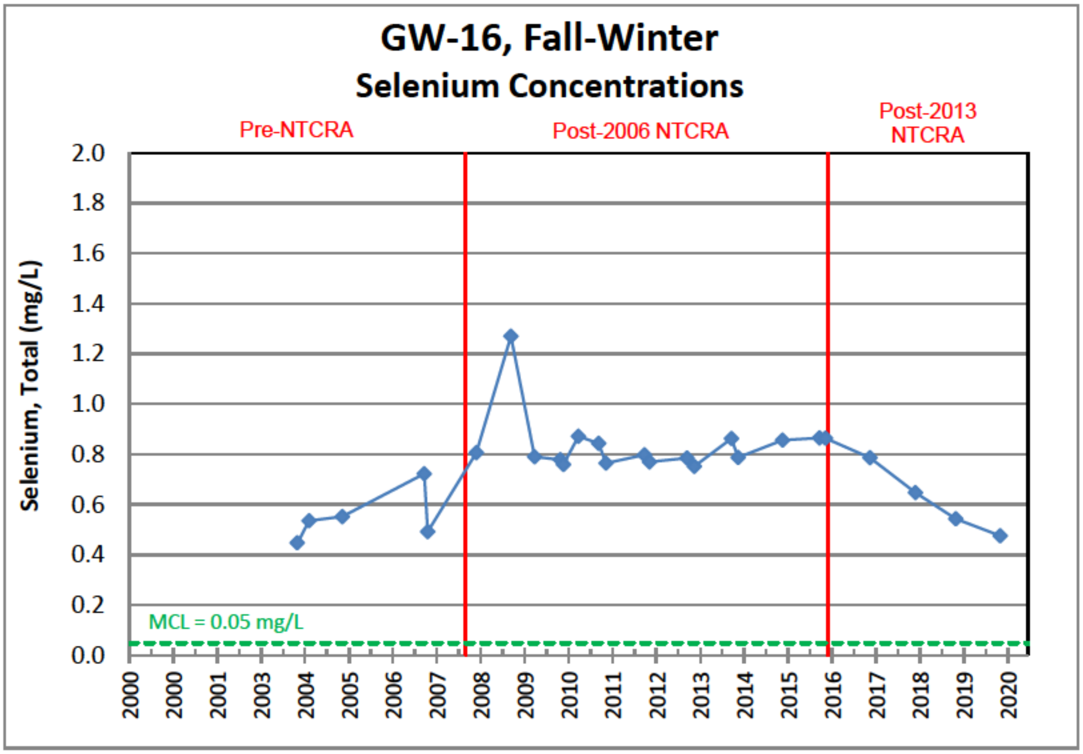
United States Environmental Protection Agency (USEPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009, EPA 530/R-09-007.

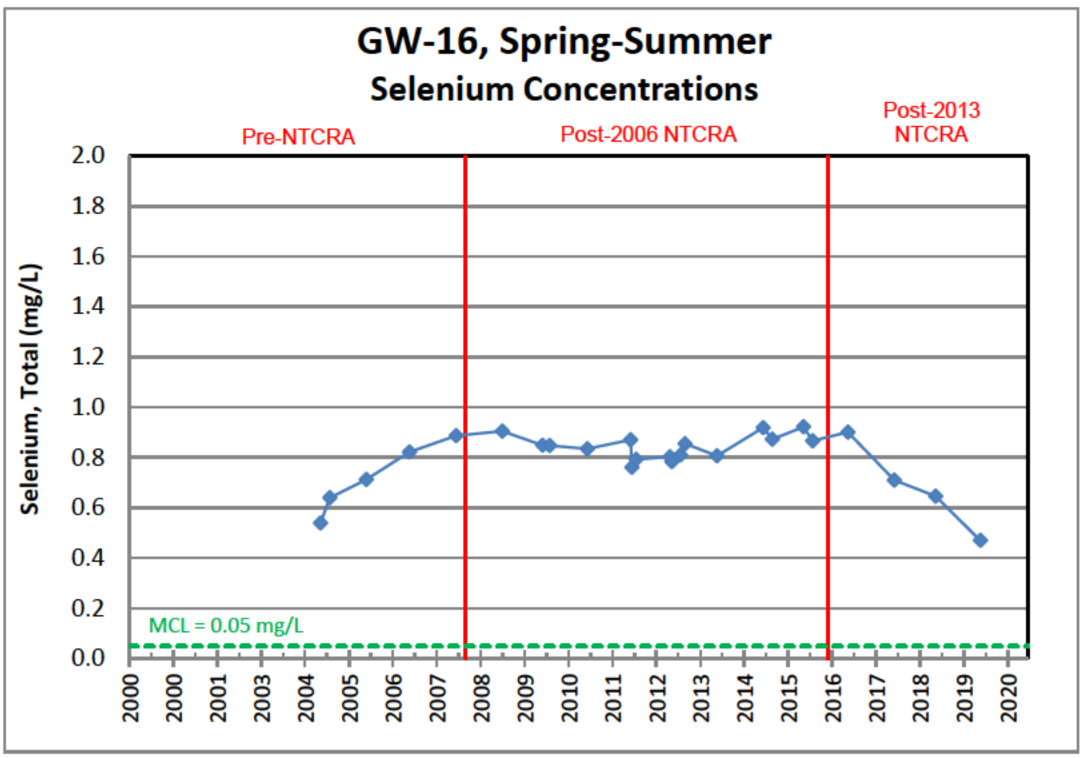
# Appendix D




Note: The June 15, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for GW-15 (spring-summer season).


GW-16, Fall-Winter
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Selenium, Total (mg/L)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
MCL = 0.05 mg/L
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020


GW-16, Spring-Summer
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Selenium, Total (mg/L)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
MCL = 0.05 mg/L
2000
2000
2001
2003
2004
2005
2006
2007
2008
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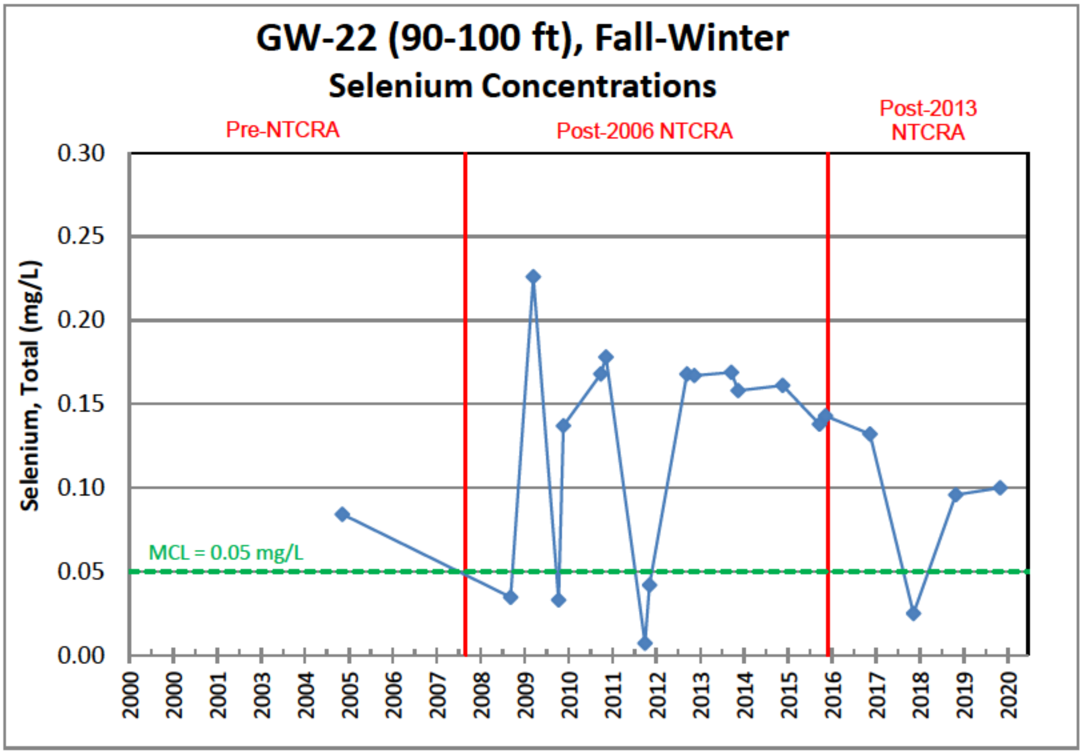
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020


GW-22 (90-100 ft), Fall-Winter
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
MCL = 0.05 mg/L
Selenium, Total (mg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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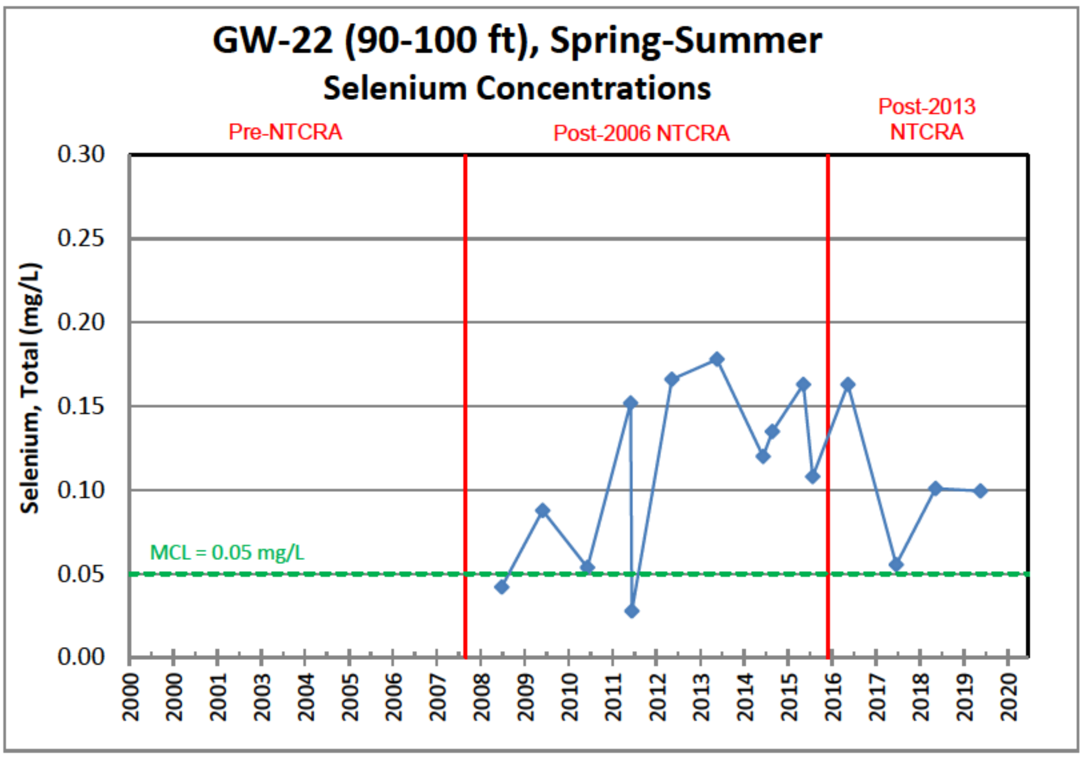
2015
2016
2017
2018
2019
2020


GW-22 (90-100 ft), Spring-Summer
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
MCL = 0.05 mg/L
Selenium, Total (mg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
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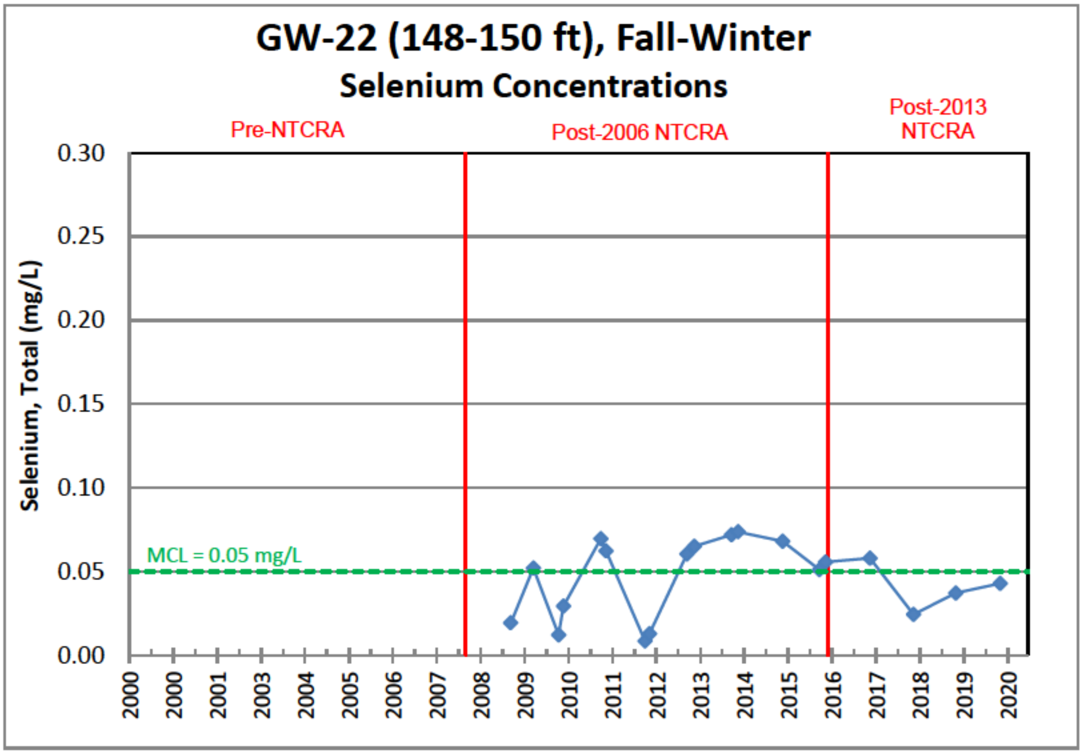
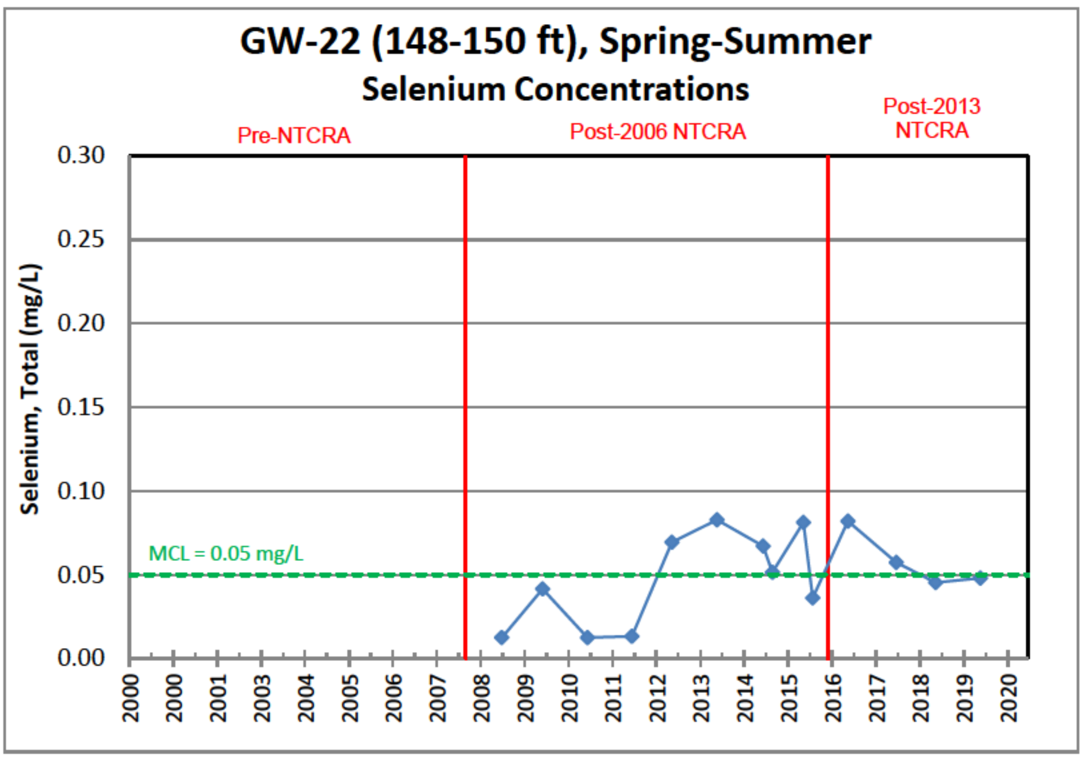
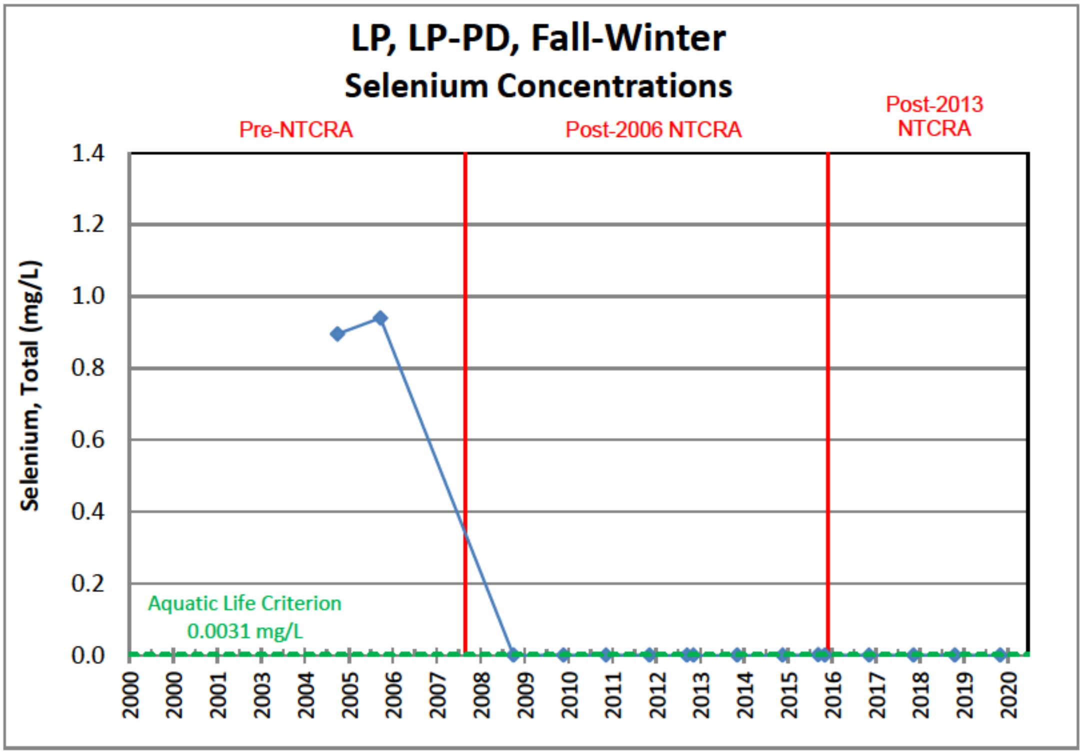
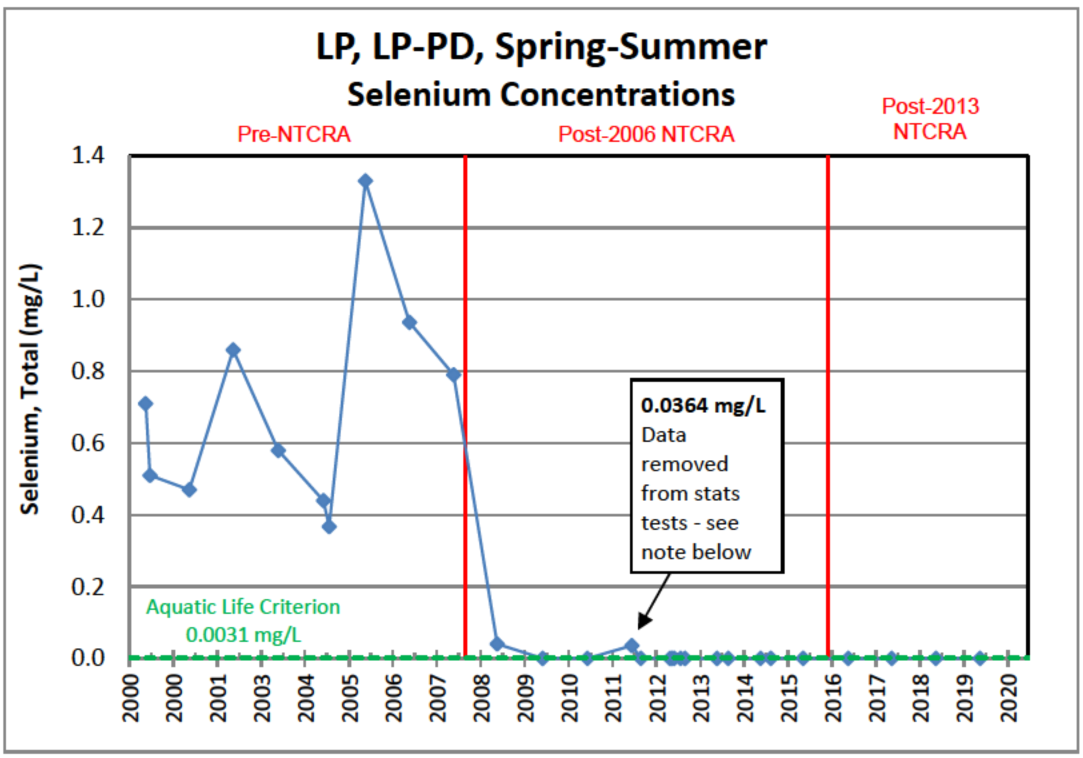
2016
2017
2018
2019
2020

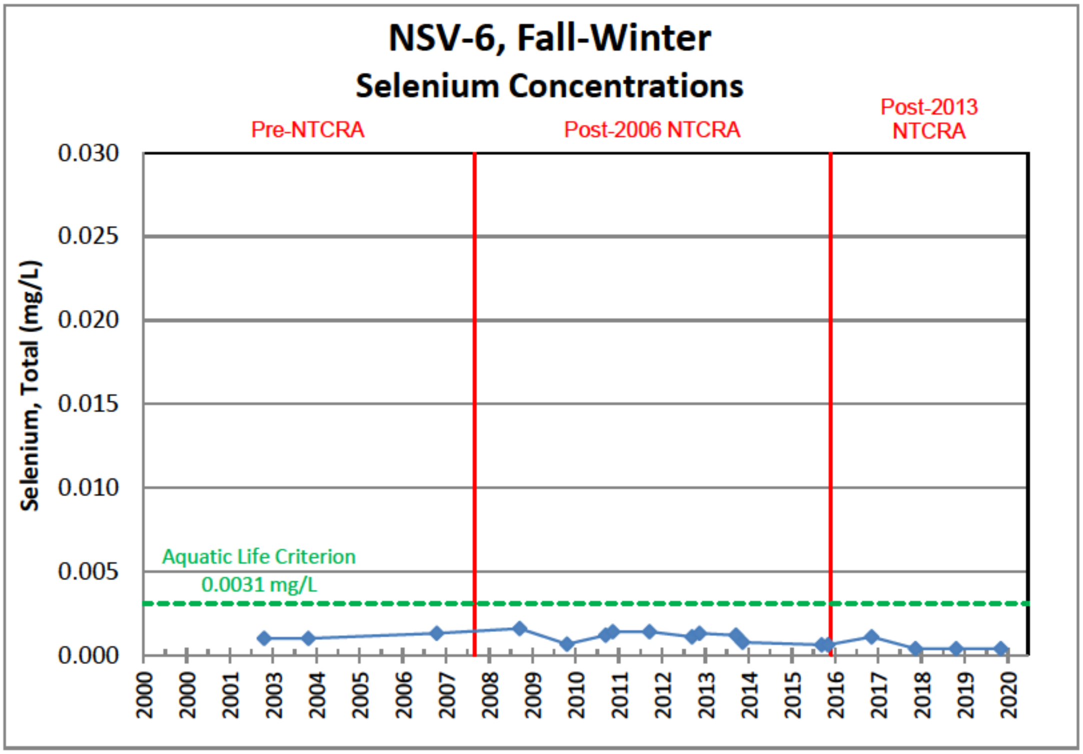

GW-22 (148-150 ft), Fall-Winter
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Selenium, Total (mg/L)
MCL = 0.05 mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

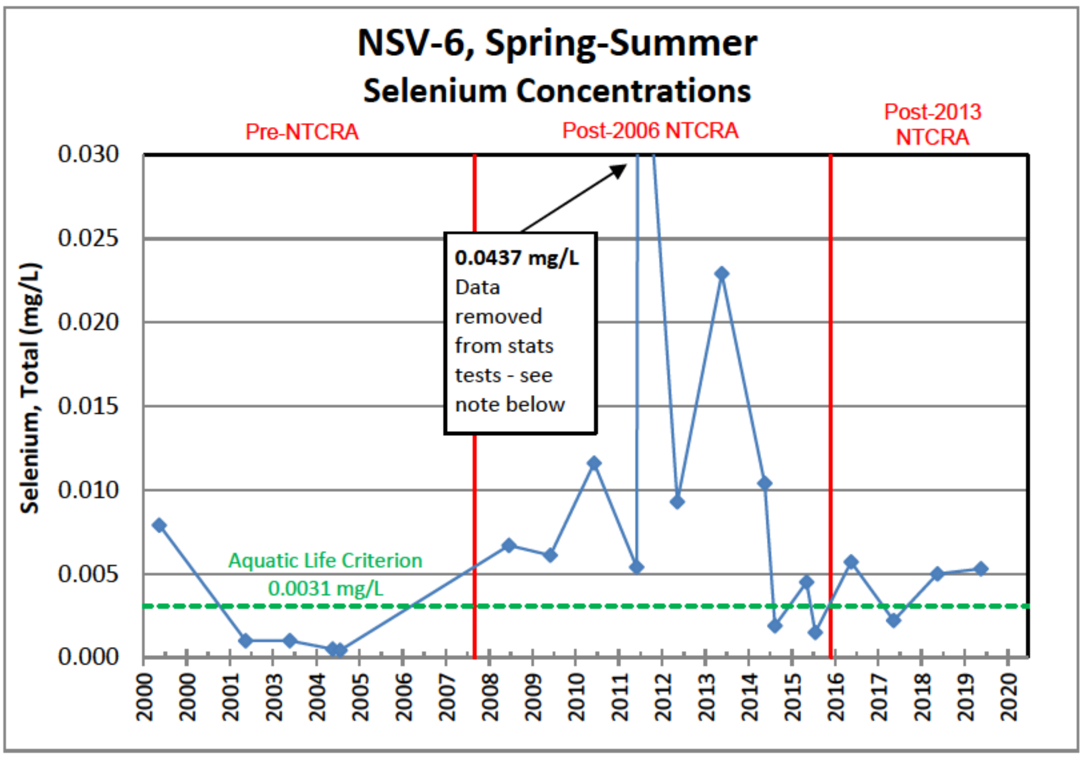

GW-22 (148-150 ft), Spring-Summer
Selenium Concentrations
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Selenium, Total (mg/L)
MCL = 0.05 mg/L
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020



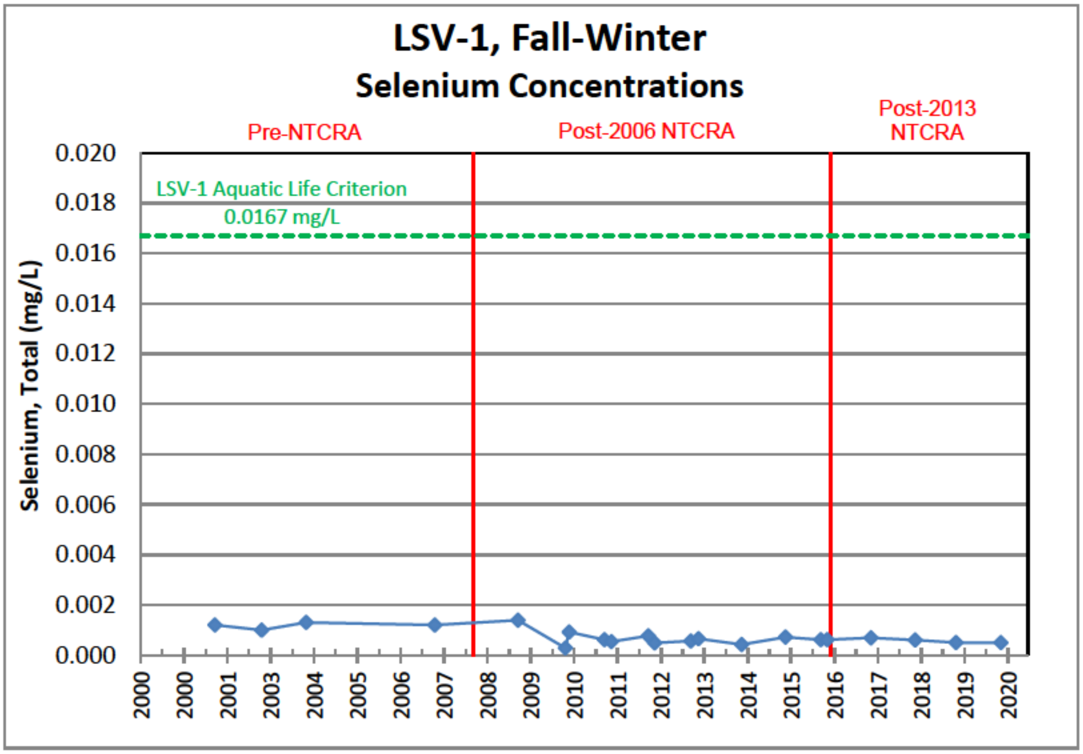



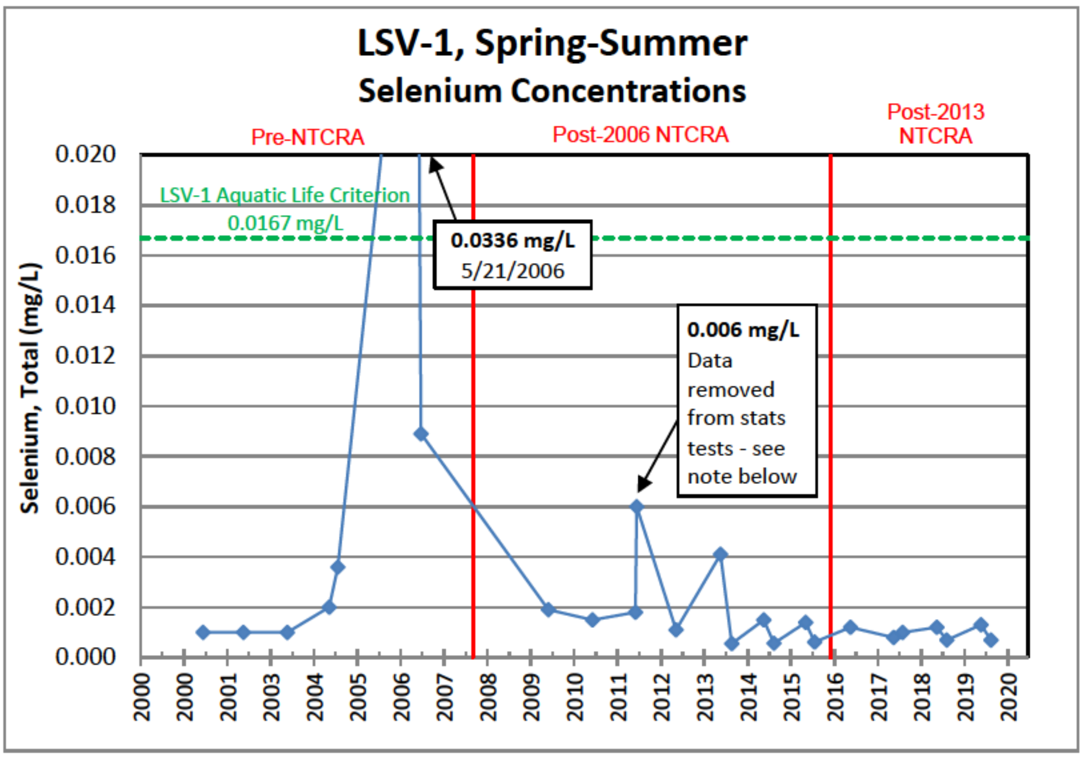

Note: The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for LP-PD (spring-summer season).



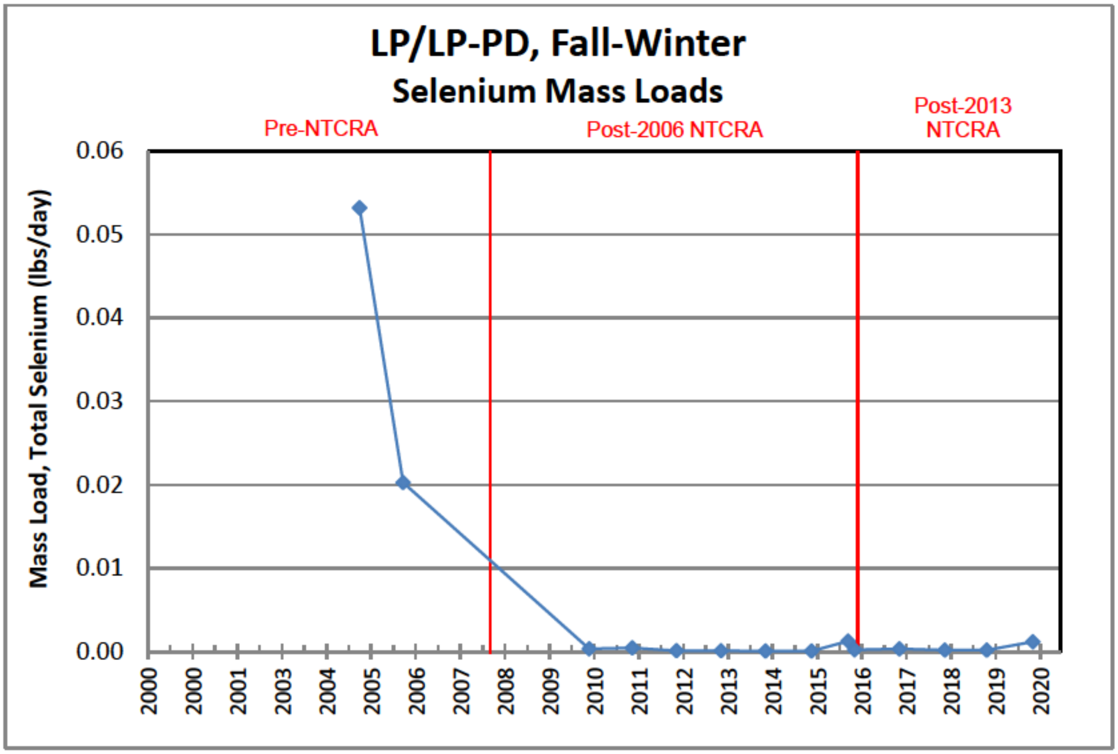



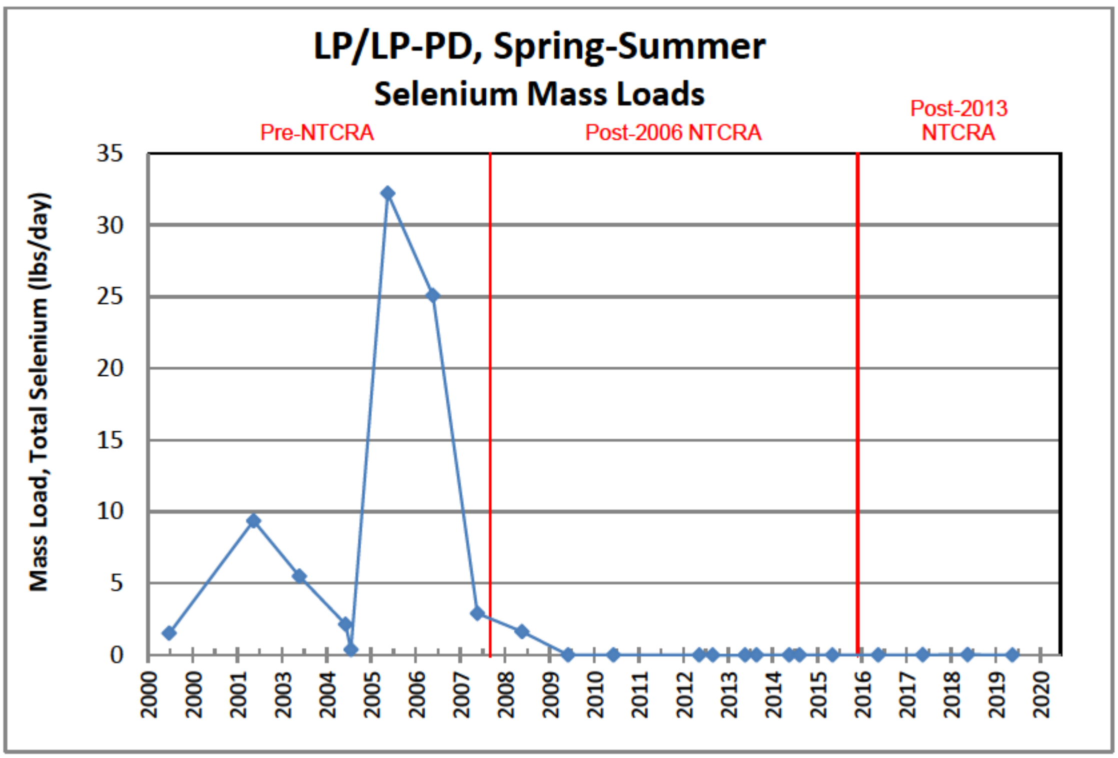

Note: The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for NSV-6 (spring-summer season).

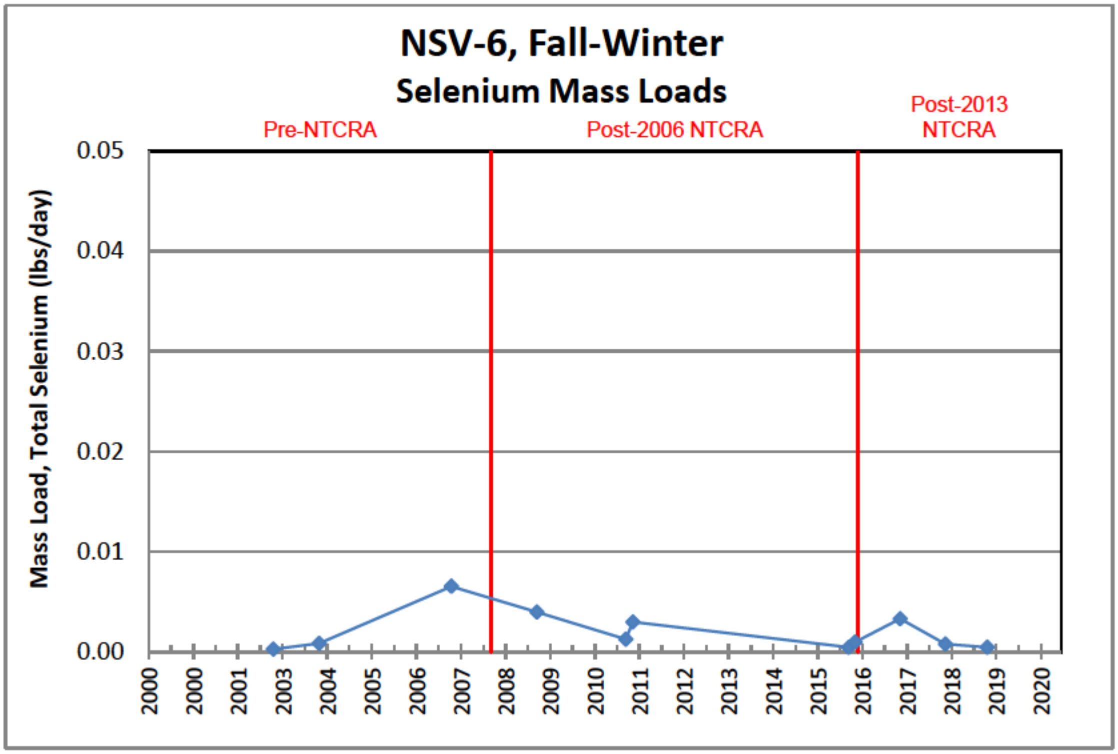


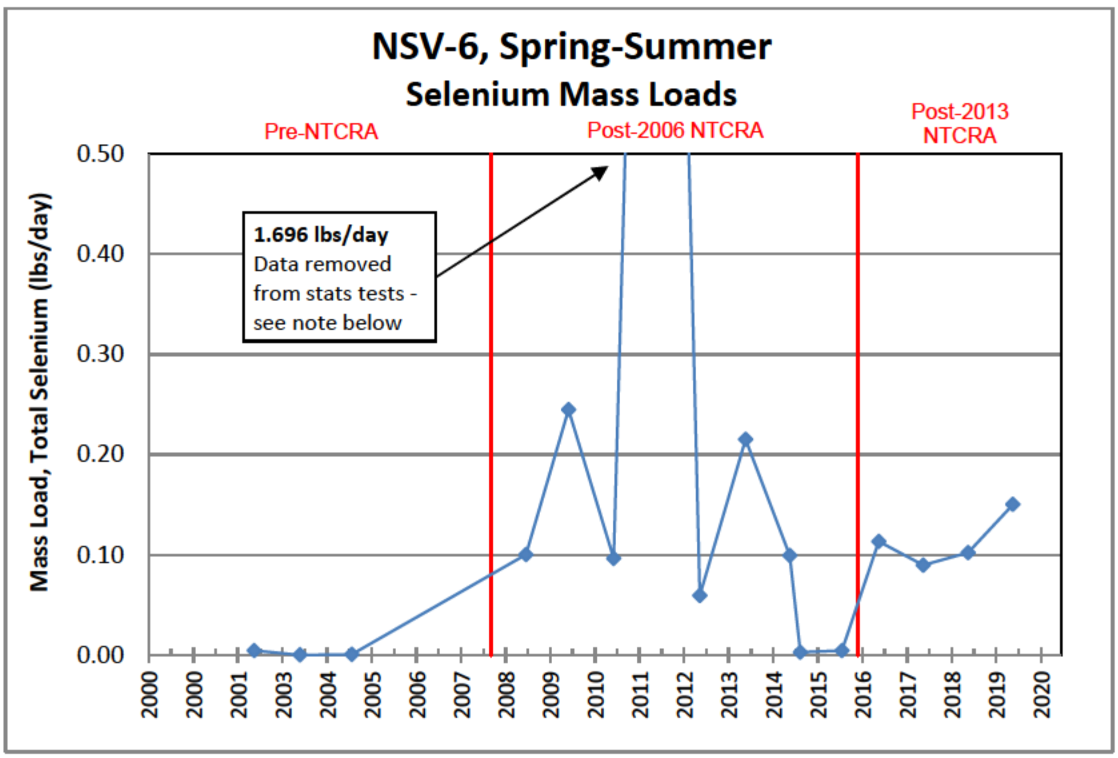




Note: The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for LSV-1 (spring-summer season).

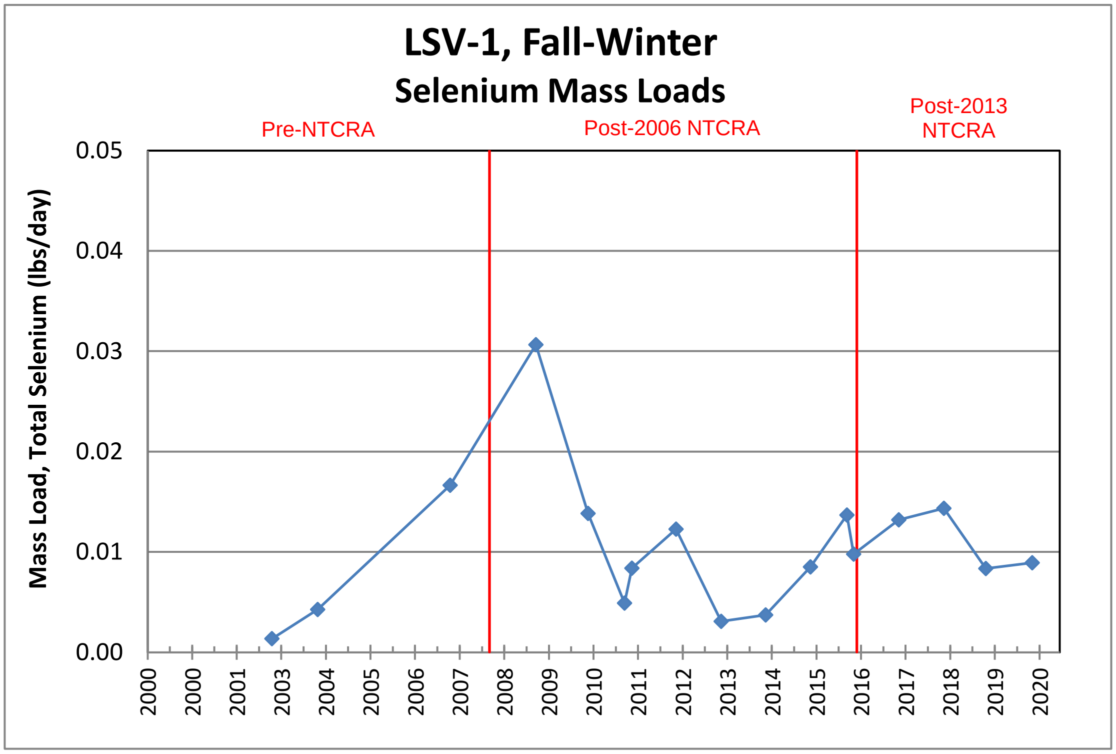

LP/LP-PD, Fall-Winter
Selenium Mass Loads
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Mass Load, Total Selenium (lbs/day)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020

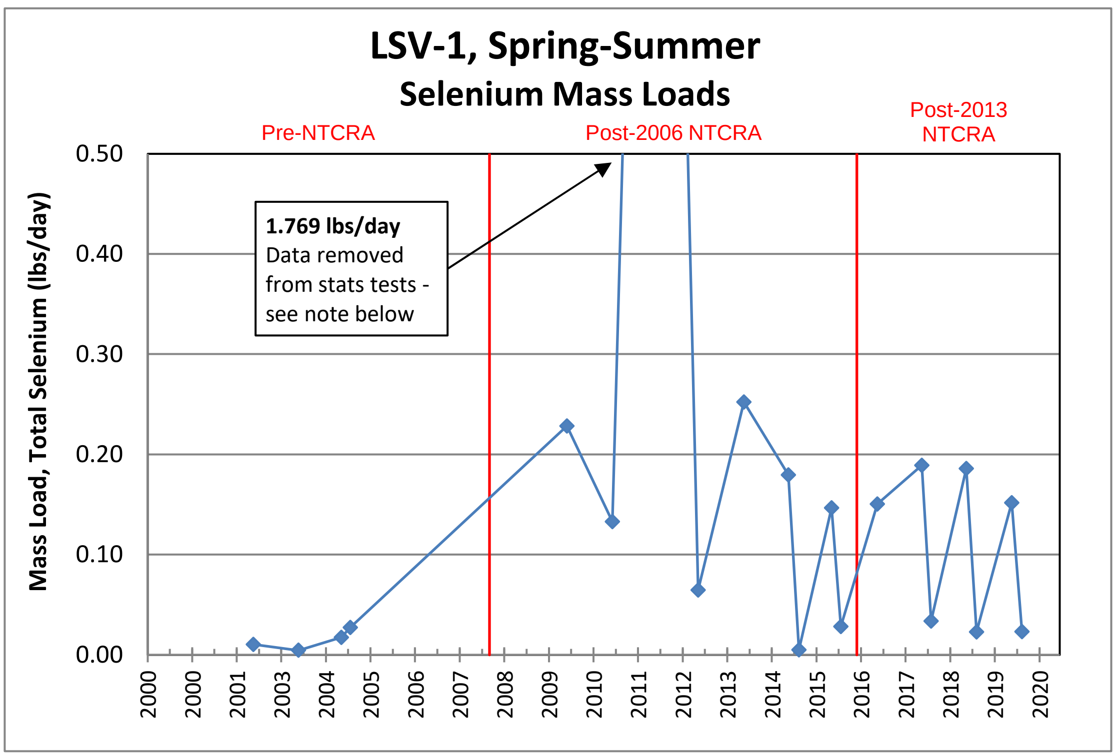

LP/LP-PD, Spring-Summer
Selenium Mass Loads
Pre-NTCRA
Post-2006 NTCRA
Post-2013 NTCRA
Mass Load, Total Selenium (lbs/day)
35
30
25
20
15
10
5
0
2000
2000
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020




Note: The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for NSV-6 (spring-summer season).




Note: The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for LSV-1 (spring-summer season).

## Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Alluvial GW: GW-15** | **GW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| GW-15 | GW | Fall-Winter | 10/29/2003 | 0.309 | 0.01 | 0.05 | | SM3114C | SVL |
| | | | 2/4/2004 | 0.317 | 0.01 | 0.05 | | SM3114C | SVL |
| | | | 11/8/2004 | 0.664 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 12/1/2005 | 0.742 | 0.04 | 0.2 | | SM3114C | SVL |
| | | | 9/20/2006 | 0.936 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 10/18/2006 | 0.796 | 0.04 | Not reported | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-15 | GW | Fall-Winter | 11/5/2007 | 0.293 | 0.01 | 2 | B | SM3114C | SVL |
| | | | 9/10/2008 | 0.422 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 3/16/2009 | 0.207 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 10/23/2009 | 0.175 | 0.005 | 0.05 | | SM3114C | SVL |
| | | | 11/21/2009 | 0.136 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 3/25/2010 | 0.116 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 9/10/2010 | 0.0897 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 11/11/2010 | 0.119 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 9/27/2011 | 0.31 | 0.01 | 0.1 | | SM3114C | SVL |
| | | | 11/7/2011 | 0.18 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 9/13/2012 | 0.128 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 11/15/2012 | 0.0892 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 9/18/2013 | 0.0309 | 0.001 | 0.01 | | SM 3114C | SVL |
| | | | 11/15/2013 | 0.0341 | 0 0006 | 0 006 | | SM 3114C | SVL |
| | | | 11/19/2014 | 0.27 | 0.01 | 0.1 | | SM 3114C | SVL |
| | | | 9/22/2015 | 0.158 | 0 00062 | 0 002 | | EPA 6020A | SVL |
| | | | 11/11/2015 | 0.136 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 11/15/2016 | 0.321 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 11/29/2017 | 0.0563 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 10/29/2018 | 0.0247 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 11/4/2019 | 0.0322 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| **Alluvial GW: GW-15** | **GW** | **Spring-Summer** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| GW-15 | GW | Spring-Summer | 5/9/2004 | 1.33 | 0.06 | 0.2 | | SM3114C | SVL |
| | | | 7/25/2004 | 0.61 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 5/25/2005 | 1.19 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 5/16/2006 | 1.48 | 0.04 | 0.4 | | SM3114C | SVL |
| | | | 6/12/2007 | 1.17 | 0.013 | 0.03 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-15 | GW | Spring-Summer [a] | 7/1/2008 | 0.255 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 6/2/2009 | 1.61 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 7/30/2009 | 0.363 | 0.008 | 0.08 | | SM3114C | SVL |
| | | | 6/8/2010 | 0.286 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 6/15/2011 | 5.19 | 0.2 | 2 | | SM3114C | SVL |
| | | | 5/11/2012 | 0.724 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 5/21/2013 | 0.15 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 6/11/2014 | 1.57 | 0.04 | 0.4 | | SM 3114C | SVL |
| | | | 8/26/2014 | 0.362 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 5/8/2015 | 0.109 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 7/28/2015 | 0.265 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 5/16/2016 | 0.391 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 6/6/2017 | 0.0699 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 5/15/2018 | 0.118 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 5/22/2019 | 0.139 | 0 0002 | 0 002 | | EPA 6020B | SVL |

# Table D-1.  Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Wells Fm GW: GW-16** | **GW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| GW-16 | GW | Fall-Winter | 10/29/2003 | 0.447 | 0.008 | 0.04 | | SM3114C | SVL |
| | | | 2/3/2004 | 0.536 | 0.01 | 0.05 | | SM3114C | SVL |
| | | | 11/8/2004 | 0.552 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 9/20/2006 | 0.723 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 10/18/2006 | 0.492 | 0.04 | Not reported | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-16 | GW | Fall-Winter | 11/28/2007 | 0.806 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 9/10/2008 | 1.27 | 0.04 | 0.4 | | SM3114C | SVL |
| | | | 3/27/2009 | 0.79 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 10/25/2009 | 0.778 | 0.01 | 0.1 | | SM3114C | SVL |
| | | | 11/21/2009 | 0.759 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 3/25/2010 | 0.871 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 9/10/2010 | 0.844 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 11/11/2010 | 0.765 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 9/27/2011 | 0.798 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 11/7/2011 | 0.769 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 9/13/2012 | 0.785 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 11/15/2012 | 0.752 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 9/18/2013 | 0.862 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 11/15/2013 | 0.787 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 11/19/2014 | 0.856 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 9/22/2015 | 0.865 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 11/11/2015 | 0.864 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 11/14/2016 | 0.786 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 11/28/2017 | 0.648 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 10/29/2018 | 0.543 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 11/4/2019 | 0.476 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| **Wells Fm GW: GW-16** | **GW** | **Spring-Summer** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| GW-16 | GW | Spring-Summer | 5/9/2004 | 0.539 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 7/25/2004 | 0.64 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 5/26/2005 | 0.712 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 5/19/2006 | 0.822 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 6/12/2007 | 0.887 | 0.013 | 0.03 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-16 | GW | Spring-Summer | 7/1/2008 | 0.905 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 6/2/2009 | 0.849 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 7/30/2009 | 0.847 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 6/8/2010 | 0.834 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 6/2/2011 | 0.87 | 0.01 | 0.1 | | SM3114C | SVL |
| | | | 6/15/2011 | 0.761 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 7/19/2011 | 0.792 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 4/25/2012 | 0.803 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 5/11/2012 | 0.784 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 7/23/2012 | 0.81 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 8/30/2012 | 0.855 | 0.01 | 0.1 | | SM 3114C | SVL |
| | | | 5/21/2013 | 0.807 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 6/11/2014 | 0.918 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 8/26/2014 | 0.873 | 0.02 | 0.2 | | SM 3114C | SVL |
| | | | 5/11/2015 | 0.922 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 7/28/2015 | 0.867 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 5/16/2016 | 0.901 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 6/6/2017 | 0.71 | 0.0004 | 0.002 | | EPA 6020A | SVL |
| | | | 5/15/2018 | 0.646 | 0.0002 | 0.002 | | EPA 6020B | SVL |
| | | | 5/22/2019 | 0.47 | 0.0002 | 0.002 | | EPA 6020B | SVL |

# Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Alluvial GW: GW-22, 90-100 ft** | **GW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| GW-22, 90-100 ft | GW | Fall-Winter | 11/8/2004 | 0.0841 | 0.003 | 0.01 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-22, 90-100 ft | GW | Fall-Winter | 9/9/2008 | 0.0346 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 3/16/2009 | 0.226 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 10/12/2009 | 0.0329 | 0.0004 | 0.004 | | SM3114C | SVL |
| | | | 11/22/2009 | 0.137 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 9/29/2010 | 0.168 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 11/11/2010 | 0.178 | 0.004 | 0.04 | | SM3114C | SVL |
| | | | 10/1/2011 | 0.0072 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 11/7/2011 | 0.042 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 9/13/2012 | 0.168 | 0.004 | 0.04 | | SM 3114C | SVL |
| | | | 11/15/2012 | 0.167 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 9/18/2013 | 0.169 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 11/15/2013 | 0.158 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 11/19/2014 | 0.161 | 0.004 | 0.04 | | SM 3114C | SVL |
| | | | 9/22/2015 | 0.138 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 11/11/2015 | 0.143 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 11/14/2016 | 0.132 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 11/13/2017 | 0.0249 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 10/29/2018 | 0.0957 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 11/4/2019 | 0.1 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| **Alluvial GW: GW-22, 90-100 ft** | **SW** | **Spring-Summer** | | | | | | | |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-22, 90-100 ft | GW | Spring-Summer | 6/25/2008 | 0.0421 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 6/2/2009 | 0.0878 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 6/8/2010 | 0.0537 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 6/2/2011 | 0.152 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 6/15/2011 | 0.0278 | 0 0008 | 0 008 | | SM3114C | SVL |
| | | | 5/11/2012 | 0.166 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 5/21/2013 | 0.178 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 6/11/2014 | 0.12 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 8/26/2014 | 0.135 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 5/11/2015 | 0.163 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 7/28/2015 | 0.108 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 5/16/2016 | 0.163 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 6/21/2017 | 0.0554 | 0.0004 | 0.002 | | EPA 6020A | SVL |
| | | | 5/15/2018 | 0.101 | 0.0002 | 0.002 | | EPA 6020B | SVL |
| | | | 5/22/2019 | 0.0994 | 0.0002 | 0.002 | | EPA 6020B | SVL |

# Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Alluvial GW: GW-22, 148-150 ft** | **GW** | **Fall-Winter** | | | | | | | |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-22, 148-150 ft | GW | Fall-Winter | 9/9/2008 | 0.0193 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 3/17/2009 | 0.0521 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 10/12/2009 | 0.0122 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 11/22/2009 | 0.0294 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 9/28/2010 | 0.0697 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 11/11/2010 | 0.0623 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 10/1/2011 | 0.0085 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 11/7/2011 | 0.0129 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 9/13/2012 | 0.0605 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 11/15/2012 | 0.0651 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 9/18/2013 | 0.0719 | 0.001 | 0.01 | | SM 3114C | SVL |
| | | | 11/15/2013 | 0.0738 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 11/19/2014 | 0.068 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 9/22/2015 | 0.051 | 0 00062 | 0 002 | | EPA 6020A | SVL |
| | | | 11/11/2015 | 0.0557 | 0 00011 | 0 002 | | EPA 6020A | SVL |
| | | | 11/14/2016 | 0.058 | 0 00024 | 0 002 | | EPA 6020A | SVL |
| | | | 11/13/2017 | 0.0244 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 10/29/2018 | 0.0372 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 11/4/2019 | 0.0429 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| **Alluvial GW: GW-22, 148-150 ft** | **GW** | **Spring-Summer** | | | | | | | |
| **Post-NTCRA Time Period** | | | | | | | | | |
| GW-22, 148-150 ft | GW | Spring-Summer | 6/25/2008 | 0.0125 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 6/2/2009 | 0.0416 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 6/8/2010 | 0.0126 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 6/15/2011 | 0.0132 | 0 0002 | 0 002 | | SM3114C | SVL |
| | | | 5/11/2012 | 0.0695 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 5/21/2013 | 0.0828 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 6/11/2014 | 0.0671 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 8/26/2014 | 0.0514 | 0.002 | 0.02 | | SM 3114C | SVL |
| | | | 5/11/2015 | 0.0812 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 7/28/2015 | 0.0362 | 0.00011 | 0 002 | | EPA 6020A | SVL |
| | | | 5/16/2016 | 0.082 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 6/21/2017 | 0.0574 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 5/15/2018 | 0.0453 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 5/22/2019 | 0.048 | 0 0002 | 0 002 | | EPA 6020B | SVL |

# Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Lower Pole Canyon Creek: LP, LP-PD** | **SW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| LP | SW | Fall-Winter | 9/28/2004 | 0.895 | 0.03 | 0.1 | | SM3114C | SVL |
| | | | 9/20/2005 | 0.94 | 0.02 | 0.2 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| LP-PD | SW | Fall-Winter | 10/1/2008 | 0.0002 | 0.0002 | 0.002 | U | SM3114C | SVL |
| | | | 11/21/2009 | 0.00045 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 11/11/2010 | 0.00044 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 11/7/2011 | 0.00022 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 9/13/2012 | 0.0002 | 0.0002 | 0.002 | U | SM3114C | SVL |
| | | | 11/7/2012 | 0.0002 | 0.0002 | 0.002 | U | SM3114C | SVL |
| | | | 11/5/2013 | 0.0002 | 0.0002 | 0.002 | U | SM 3114C | SVL |
| | | | 11/19/2014 | 0.0002 | 0.0002 | 0.002 | U | SM 3114C | SVL |
| | | | 9/12/2015 | 0.0014 | 0 00062 | 0.002 | J | EPA 6020A | SVL |
| | | | 11/5/2015 | 0.00062 | 0 00062 | 0.002 | U | EPA 6020A | SVL |
| | | | 11/7/2016 | 0.0004 | 0.0002 | 0.005 | J | EPA 6020A | SVL |
| | | | 11/13/2017 | 0.0004 | 0.0004 | 0.002 | U | EPA 6020A | SVL |
| | | | 10/22/2018 | 0.0003 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| | | | 11/4/2019 | 0.0002 | 0.0002 | 0.002 | U | EPA 6020B | SVL |
| **Lower Pole Canyon Creek: LP, LP-PD** | **SW** | **Spring-Summer** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| LP | SW | Spring-Summer | 5/15/2000 | 0.71 | -- | -- | -- | -- | -- |
| | | | 6/22/2000 | 0.51 | -- | -- | -- | -- | -- |
| | | | 5/15/2001 | 0.47 | -- | -- | -- | -- | -- |
| | | | 5/15/2002 | 0.86 | 0.02 | 0.1 | | SM3500-Se C | -- |
| | | | 5/24/2003 | 0.58 | 0.02 | 0.1 | | SM3114C | ACZ |
| | | | 6/4/2004 | 0.44 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 7/20/2004 | 0.368 | 0.015 | 0.05 | | SM3114C | SVL |
| | | | 5/18/2005 | 1.33 | 0.02 | 0.2 | | SM3114C | SVL |
| | | | 5/21/2006 | 0.936 | 0.04 | 0.4 | | SM3114C | SVL |
| | | | 5/22/2007 | 0.79 | 0.02 | 0.2 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| LP-PD | SW | Spring-Summer [a] | 5/19/2008 | 0.0409 | 0.002 | 0.02 | | SM3114C | SVL |
| | | | 6/2/2009 | 0.00041 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 6/8/2010 | 0.0005 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 6/14/2011 | 0.0364 | 0.0008 | 0.008 | | SM3114C | SVL |
| | | | 8/28/2011 | 0.00047 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 4/25/2012 | 0.00045 | 0.0002 | 0.002 | J | SM3114C | SVL |
| | | | 5/11/2012 | 0.0002 | 0.0002 | 0.002 | U | SM3114C | SVL |
| | | | 5/30/2012 | 0.00023 | 0.0002 | 0.002 | J | SM3114C | SVL |
| | | | 7/23/2012 | 0.00026 | 0.0002 | 0.002 | J | SM3114C | SVL |
| | | | 8/30/2012 | 0.0002 | 0.0002 | 0.002 | U | SM3114C | SVL |
| | | | 5/21/2013 | 0.0002 | 0.0002 | 0.002 | U | SM 3114C | SVL |
| | | | 8/23/2013 | 0.0002 | 0.0002 | 0.002 | U | SM 3114C | SVL |
| | | | 5/20/2014 | 0.00031 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 8/12/2014 | 0.00044 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 5/8/2015 | 0.00062 | 0 00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 5/18/2016 | 0.0002 | 0 0002 | 0 005 | U | EPA 6020A | SVL |
| | | | 5/15/2017 | 0.0004 | 0 0004 | 0 002 | U | EPA 6020A | SVL |
| | | | 5/18/2018 | 0.0009 | 0 0002 | 0 002 | J | EPA 6020B | SVL |
| | | | 5/21/2019 | 0.0004 | 0 0002 | 0 002 | J | EPA 6020B | SVL |

# Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **North Fork Sage Creek: NSV-6** | **SW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| NSV-6 | SW | Fall-Winter | 10/18/2002 | 0.001 | 0.001 | 0.005 | U | SM3114C | ACZ |
| | | | 10/28/2003 | 0.001 | 0.0002 | 0 001 | | SM3114C | SVL |
| | | | 10/17/2006 | 0.0013 | 0 0002 | Not reported | B | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| NSV-6 | SW | Fall-Winter | 9/16/2008 | 0.0016 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 10/21/2009 | 0.00066 | 0.0002 | 0 002 | B | SM3114C | SVL |
| | | | 9/14/2010 | 0.0012 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 11/11/2010 | 0.0014 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 9/20/2011 | 0.0014 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 9/13/2012 | 0.0011 | 0.0002 | 0.002 | J | SM3114C | SVL |
| | | | 11/15/2012 | 0.0013 | 0.0002 | 0.002 | J | SM3114C | SVL |
| | | | 9/18/2013 | 0.0012 | 0.0002 | 0.002 | J | SM 3114C | SVL |
| | | | 11/15/2013 | 0.00078 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 9/12/2015 | 0.00062 | 0 00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 11/5/2015 | 0.00062 | 0 00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 11/8/2016 | 0.0011 | 0 00024 | 0.002 | J | EPA 6020A | SVL |
| | | | 11/13/2017 | 0.0004 | 0.0004 | 0.002 | J | EPA 6020A | SVL |
| | | | 10/22/2018 | 0.0004 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| | | | 11/7/2019 | 0.0004 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| **North Fork Sage Creek: NSV-6** | **SW** | **Spring-Summer** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| NSV-6 | SW | Spring-Summer | 5/16/2000 | 0.0079 | -- | -- | -- | ICP, Hydride | -- |
| | | | 5/15/2002 | 0.001 | 0.001 | 0 005 | B | SM 3500-Se C | -- |
| | | | 5/24/2003 | 0.001 | 0.001 | 0 005 | U | SM3114C | ACZ |
| | | | 5/19/2004 | 0.0005 | 0 0003 | 0 001 | B | SM3114C | SVL |
| | | | 7/22/2004 | 0 00043 | 0 0003 | 0 001 | B | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| NSV-6 | SW | Spring-Summer[a] | 6/19/2008 | 0.0067 | 0 0002 | 0 002 | | SM3114C | SVL |
| | | | 6/2/2009 | 0.0061 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 6/7/2010 | 0.0116 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 6/2/2011 | 0.0054 | 0.0002 | 0.002 | | SM3114C | SVL |
| | | | 6/14/2011 | 0.0437 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 5/11/2012 | 0.0093 | 0 0002 | 0 002 | | SM3114C | SVL |
| | | | 5/21/2013 | 0.0229 | 0 0004 | 0 004 | | SM 3114C | SVL |
| | | | 5/20/2014 | 0.0104 | 0 0002 | 0 002 | | SM 3114C | SVL |
| | | | 8/14/2014 | 0.0019 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 5/8/2015 | 0.0045 | 0.00062 | 0 002 | | EPA 6020A | SVL |
| | | | 7/21/2015 | 0.0015 | 0.00062 | 0 002 | J | EPA 6020A | SVL |
| | | | 5/18/2016 | 0.0057 | 0.00024 | 0 002 | | EPA 6020A | SVL |
| | | | 5/15/2017 | 0.0022 | 0 0004 | 0 002 | | EPA 6020A | SVL |
| | | | 5/18/2018 | 0.005 | 0 0002 | 0 002 | | EPA 6020B | SVL |
| | | | 5/21/2019 | 0.0053 | 0 0002 | 0 002 | | EPA 6020B | SVL |

# Table D-1. Monitoring Data Used for 2019 Statistical Evaluations

| Monitoring Location | Sample Media | Season | Date | Selenium, Total (mg/L) | MDL (mg/L) | PQL (mg/L) | Lab Qualifier[1] | Analytical Method | Lab |
|---|---|---|---|---|---|---|---|---|---|
| **Sage Creek: LSV-1** | **SW** | **Fall-Winter** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| LSV-1 | SW | Fall-Winter | 9/18/2001 | 0.0012 | 0.001 | -- | -- | ICP-HG | -- |
| | | | 10/17/2002 | 0.001 | 0.001 | 0.005 | U | SM3114C | ACZ |
| | | | 10/27/2003 | 0.0013 | 0.0002 | 0.001 | | SM3114C | SVL |
| | | | 10/17/2006 | 0.0012 | 0 0002 | Not reported | B | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| LSV-1 | SW | Fall-Winter | 9/17/2008 | 0.0014 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 10/21/2009 | 0.00029 | 0.0002 | 0 002 | B | SM3114C | SVL |
| | | | 11/20/2009 | 0.00092 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 9/14/2010 | 0.00062 | 0.0002 | 0.002 | B | SM3114C | SVL |
| | | | 11/13/2010 | 0.00054 | 0.0002 | 0 002 | B | SM3114C | SVL |
| | | | 9/19/2011 | 0.00077 | 0.0002 | 0.002 | B | SM 3114C | SVL |
| | | | 11/10/2011 | 0.00049 | 0 0002 | 0 002 | B | SM 3114C | SVL |
| | | | 9/10/2012 | 0.00057 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 11/15/2012 | 0 00065 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 11/14/2013 | 0 00043 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 11/17/2014 | 0 00072 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 9/10/2015 | 0 00062 | 0.00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 11/4/2015 | 0 00062 | 0.00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 11/8/2016 | 0 00069 | 0.00024 | 0 002 | J | EPA 6020A | SVL |
| | | | 11/14/2017 | 0.0006 | 0 0004 | 0 002 | J | EPA 6020A | SVL |
| | | | 10/24/2018 | 0.0005 | 0 0002 | 0 002 | J | EPA 6020B | SVL |
| | | | 11/6/2019 | 0.0005 | 0 0002 | 0 002 | J | EPA 6020B | SVL |
| **Sage Creek: LSV-1** | **SW** | **Spring-Summer** | | | | | | | |
| **Pre-NTCRA Time Period** | | | | | | | | | |
| LSV-1 | SW | Spring-Summer | 6/12/2001 | 0.001 | 0.001 | -- | -- | ICP-HG | -- |
| | | | 5/16/2002 | 0.001 | 0.001 | 0 005 | U | SM 3500-Se C | -- |
| | | | 5/22/2003 | 0.001 | 0.001 | 0 005 | U | SM3114C | ACZ |
| | | | 5/8/2004 | 0.002 | 0 0003 | 0 001 | | SM3114C | SVL |
| | | | 7/21/2004 | 0.0036 | 0 0003 | 0 001 | | SM3114C | SVL |
| | | | 5/21/2006 | 0.0336 | 0.001 | 0.01 | | SM3114C | SVL |
| | | | 6/22/2006 | 0.0089 | 0 0002 | 0 002 | | SM3114C | SVL |
| **Post-NTCRA Time Period** | | | | | | | | | |
| LSV-1 | SW | Spring-Summer [a] | 5/31/2009 | 0.0019 | 0 0002 | 0 002 | B | SM3114C | SVL |
| | | | 6/6/2010 | 0.0015 | 0 0002 | 0 002 | B | SM3114C | SVL |
| | | | 6/1/2011 | 0.0018 | 0 0002 | 0 002 | B | SM3114C | SVL |
| | | | 6/14/2011 | 0.006 | 0 0002 | 0 002 | | SM3114C | SVL |
| | | | 5/10/2012 | 0.0011 | 0 0002 | 0 002 | J | SM3114C | SVL |
| | | | 5/20/2013 | 0.0041 | 0 0002 | 0 002 | | SM 3114C | SVL |
| | | | 8/23/2013 | 0 00056 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 5/19/2014 | 0.0015 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 8/13/2014 | 0 00057 | 0 0002 | 0 002 | J | SM 3114C | SVL |
| | | | 5/7/2015 | 0.0014 | 0.00062 | 0 002 | J | EPA 6020A | SVL |
| | | | 7/22/2015 | 0 00062 | 0.00062 | 0 002 | U | EPA 6020A | SVL |
| | | | 5/17/2016 | 0.0012 | 0 00024 | 0.002 | J | EPA 6020A | SVL |
| | | | 5/16/2017 | 0.0008 | 0.0004 | 0.002 | J | EPA 6020A | SVL |
| | | | 8/1/2017 | 0.001 | 0.0004 | 0.002 | J | EPA 6020A | SVL |
| | | | 5/16/2018 | 0.0012 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| | | | 8/8/2018 | 0.0007 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| | | | 5/22/2019 | 0.0013 | 0.0002 | 0.002 | J | EPA 6020B | SVL |
| | | | 8/14/2019 | 0.0007 | 0.0002 | 0.002 | J | EPA 6020B | SVL |

Notes:

[1] Lab Qualifiers are assigned by the laboratory and have the following definitions: B or J = result value is less than the PQL but greater than the MDL; U = result is less than

[a] Samples collected at monitoring locations GW-15, LP-PD, LSV-1, and NSV-6 from June 14 and 15, 2011 were collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the results associated with these samples are not considered representative of typical post-NTCRA conditions and, therefore, have been excluded from statistical comparison tests.

mg/L = milligram per liter
MDL = Method Detection Limit
PQL = Practical Quantitation Limit
SW = surface water
GW = ground water
NTCRA = Non-Time Critical Removal Action

# Table D-3. Summary Statistics for 2019 Statistical Evalutations

| Monitoring Location | Season | Time Period [1] | Number of Samples [2] | Mean Selenium Concentration (mg/L) | Standard Deviation | Data Distribution Type (Shapiro Wilk Test result) | Appropriate Statistical Tests for Trend [3] | Statistical Test for Trend Applied | Test Result (α = 0.10) | Conclusion Based on Statistical Evaluation (at desired level of confidence) |
|---|---|---|---|---|---|---|---|---|---|---|
| GW-15 | Fall-Winter | Pre-NTCRA | 6 | 0.63 | 0.26 | Normal | T-test or Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations < Pre-NTCRA | Selenium concentrations decreased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 21 | 0.16 | 0.11 | Normal | | | | |
| | Spring-Summer [5] | Pre-NTCRA | 5 | 1.16 | 0.33 | Normal | T-test or Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations < Pre-NTCRA | Selenium concentrations decreased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 14 | 0.46 | 0.51 | Lognormal | | | | |
| GW-16 | Fall-Winter | Pre-NTCRA | 5 | 0.55 | 0.11 | Normal | Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations > Pre-NTCRA | Selenium concentrations increased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 21 | 0.79 | 0.15 | No Discernible Distribution | | | | |
| | Spring-Summer | Pre-NTCRA | 5 | 0.72 | 0.14 | Normal | Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations > Pre-NTCRA | Selenium concentrations increased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 20 | 0.81 | 0.11 | No Discernible Distribution | | | | |
| GW-22 (90 to 100 ft) | Fall-Winter | Pre-NTCRA | 1 | NA | NA | Not tested | Sen's Slope Test | Sen's Slope Test | Sen's Test median slope is negative (concentrations decreasing), but additional data are needed to confirm, at the 90% confidence level, that concentrations are decreasing. | Need additional data to confirm decreasing trend at 90% confidence level. |
| | | Post-NTCRA | 19 | 0.12 | 0.063 | No Discernible Distribution | | | | |
| | Spring-Summer | Pre-NTCRA | 0 | NA | NA | NA | Sen's Slope Test or Linear Regression | Sen's Slope Test | Sen's Test median slope is positive (concentrations increasing), but additional data are needed to confirm, at the 90% confidence level, that concentrations are increasing. | Need additional data to confirm increasing trend at 90% confidence level.<br><br>Note that evaluation is based only on post-NTCRA data (pre-NTCRA data are not available) |
| | | Post-NTCRA | 15 | 0.11 | 0.049 | Normal | | | | |
| GW-22 (148 to 150 ft) | Fall-Winter | Pre-NTCRA | 0 | NA | NA | NA | Sen's Slope Test or Linear Regression | Sen's Slope Test | Sen's Test median slope is positive (concentrations increasing), but additional data are needed to confirm, at the 90% confidence level, that concentrations are increasing. | Need additional data to confirm increasing trend at 90% confidence level.<br><br>Note that evaluation is based only on post-NTCRA data (pre-NTCRA data are not available) |
| | | Post-NTCRA | 19 | 0 046 | 0.022 | Normal | | | | |
| | Spring-Summer | Pre-NTCRA | 0 | NA | NA | NA | Sen's Slope Test or Linear Regression | Sen's Slope Test | Sen's Test median slope is positive (concentrations increasing), but additional data are needed to confirm, at the 90% confidence level, that concentrations are increasing. | Need additional data to confirm increasing trend at 90% confidence level.<br><br>Note that evaluation is based only on post-NTCRA data (pre-NTCRA data are not available) |
| | | Post-NTCRA | 14 | 0 050 | 0.025 | Normal | | | | |

# Table D-3. Summary Statistics for 2019 Statistical Evalutations

| Monitoring Location | Season | Time Period [1] | Number of Samples [2] | Mean Selenium Concentration (mg/L) | Standard Deviation | Data Distribution Type (Shapiro Wilk Test result) | Appropriate Statistical Tests for Trend [3] | Statistical Test for Trend Applied | Test Result (α = 0.10) | Conclusion Based on Statistical Evaluation (at desired level of confidence) |
|---|---|---|---|---|---|---|---|---|---|---|
| LP | Fall-Winter | Pre-NTCRA | 2 | 0.92 | 0.032 | Not tested | Sen's Slope Test | Sen's Slope Test | Sen's Test median slope is negative (concentrations decreasing), but additional data are needed to confirm, at the 90% confidence level, that concentrations are decreasing. | Need additional data to confirm decreasing trend at 90% confidence level. |
| LP-PD [4] | | Post-NTCRA | 14 | 0.00039 | 0.00032 | No Discernible Distribution | | | | |
| LP | Spring-Summer [5] | Pre-NTCRA | 10 | 0.70 | 0.29 | Normal | Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations < Pre-NTCRA | Selenium concentrations decreased after implementation of 2006 NTCRA. |
| LP-PD [4] | | Post-NTCRA | 18 | 0.0026 | 0 0096 | No Discernible Distribution | | | | |
| NSV-6 [4] | Fall-Winter | Pre-NTCRA | 3 | 0.0011 | 0.00020 | Not tested | Sen's Slope Test or Linear Regression | Sen's Slope Test | Sen's test median slope is negative; concentrations are decreasing. | Selenium concentrations decreasing over time. |
| | | Post-NTCRA | 15 | 0.00095 | 0.00041 | Normal | | | | |
| | Spring-Summer [5] | Pre-NTCRA | 5 | 0.0022 | 0 0032 | Lognormal | T-test or Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations > Pre-NTCRA | Selenium concentrations increased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 14 | 0.0070 | 0 0055 | Lognormal | | | | |
| LSV-1 [4] | Fall-Winter | Pre-NTCRA | 4 | 0.0012 | 0.00013 | Not tested | Sen's Slope Test or Linear Regression | Sen's Slope Test | Sen's test median slope is negative; concentrations are decreasing. | Selenium concentrations decreasing over time. |
| | | Post-NTCRA | 17 | 0.00064 | 0.00024 | Lognormal | | | | |
| | Spring-Summer [5] | Pre-NTCRA | 7 | 0.0073 | 0.012 | Lognormal | T-test or Wilcoxon Rank-Sum | Wilcoxon Rank-Sum | Post-NTCRA concentrations < Pre-NTCRA | Selenium concentrations decreased after implementation of 2006 NTCRA. |
| | | Post-NTCRA | 17 | 0.00129 | 0.00083672 | Lognormal | | | | |

**Notes**

[1] Pre Non-Time-Critical Removal Action (NTCRA) data collected from 1/1/2000 through 9/30/2007. Post-NTCRA data collected from 10/1/2007 through 11/7/2019.

[2] Selenium concentration data used in statistical evaluations are provided in Table D-1.

[3] Refer to Section D.1 in Appendix D text for description of statistical test methods.

[4] Note that some of the source data for LP-PD, NSV-6, and LSV-1 are estimated values because selenium concentrations were less than the Practical Quantitation Limit (PQL). Therefore, the results of the statistical tests at these locations are less certain than for locations with values reported above the PQL.

[5] Samples collected at monitoring locations GW-15, LP-PD, NSV-6, and LSV-1 from June 14 and 15, 2011 were collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the results associated with these samples are not considered representative of typical post-NTCRA conditions and, therefore, have been excluded from statistical comparison tests.

# Table D-5. Selenium Mass Load Data for Lower Pole Canyon Creek (LP/LP-PD)

| Season | Monitoring Location | Date | Total Selenium (mg/L) | Flow (cfs) | Selenium Mass Load (lbs/day) |
|---|---|---|---|---|---|
| **Pre-NTCRA Time Period** | | | | | |
| Fall-Winter | LP | 9/28/2004 | 0.895 | 0.011 | 0.053 |
| | | 9/20/2005 | 0.94 | 0.004 | 0.020 |
| **Post-NTCRA Time Period** | | | | | |
| Fall-Winter | LP-PD | 11/21/2009 | 0.00045 B | 0.143 | <0.001 |
| | | 11/11/2010 | 0.00044 B | 0.200 | <0.001 |
| | | 11/7/2011 | 0.00022 B | 0.083 | <0.001 |
| | | 11/7/2012 | 0.0002 U | 0.106 | <0.001 |
| | | 11/5/2013 | 0.0002 U | 0.086 | <0.001 |
| | | 11/19/2014 | 0.0002 U | 0.086 | <0.001 |
| | | 9/12/2015 | 0.0014 J | 0.169 | 0.001 |
| | | 11/5/2015 | 0.00062 U | 0.073 | <0.001 |
| | | 11/7/2016 | 0.0004 J | 0.160 | <0.001 |
| | | 11/13/2017 | 0.0004 U | 0.095 | <0.001 |
| | | 10/22/2018 | 0.0003 J | 0.113 | <0.001 |
| | | 11/4/2019 | 0.0002 U | 1.090 | 0.001 |
| **Pre-NTCRA Time Period** | | | | | |
| Spring-Summer | LP | 6/22/2000 | 0.51 | 0.550 | 1.51 |
| | | 5/15/2002 | 0.86 | 2.019 | 9.37 |
| | | 5/24/2003 | 0.58 | 1.760 | 5.51 |
| | | 6/4/2004 | 0.44 | 0.900 | 2.14 |
| | | 7/20/2004 | 0.368 | 0.190 | 0.377 |
| | | 5/18/2005 | 1.33 | 4.492 | 32.2 |
| | | 5/21/2006 | 0.936 | 4.969 | 25.1 |
| | | 5/22/2007 | 0.79 | 0.682 | 2.91 |
| **Post-NTCRA Time Period** | | | | | |
| Spring-Summer | LP-PD | 5/19/2008 | 0.0409 | 7.371 | 1.63 |
| | | 6/2/2009 | 0.00041 B | 3.583 | 0.008 |
| | | 6/8/2010 | 0.0005 B | 2.033 | 0.005 |
| | | 5/11/2012 | 0.0002 U | 1.171 | 0.001 |
| | | 8/30/2012 | 0.0002 U | 0.148 | <0.001 |
| | | 5/21/2013 | 0.0002 U | 2.490 | 0.003 |
| | | 8/23/2013 | 0.0002 U | 0.148 | 0.010 |
| | | 5/20/2014 | 0.00031 J | 5.740 | <0.001 |
| | | 8/12/2014 | 0.00044 J | 0.380 | <0.001 |
| | | 5/8/2015 | 0.00062 U | 3.014 | 0.010 |
| | | 5/18/2016 | 0.0002 U | 2.500 | 0.003 |
| | | 5/15/2017 | 0.0004 U | 9.420 | 0.020 |
| | | 5/18/2018 | 0.0009 J | 3.623 | 0.018 |
| | | 5/21/2019 | 0.0004 J | 2.550 | 0.006 |

**Note**: Mass load values are provided only where paired Total Selenium and Flow data are available.

B : Detected at a value between Method Detection Limit and Practical Quantification Limit

J : Estimated value

U : Not detected above the Method Detection Limit

mg/L = milligrams per liter  cfs = cubic feet per second  lbs/day = pounds per day

# Table D-6. Selenium Mass Load Data for North Sage Valley (NSV-6)

| Season | Monitoring Location | Date | Total Selenium (mg/L) | Flow (cfs) | Selenium Mass Load (lbs/day) |
|---|---|---|---|---|---|
| **Pre-NTCRA Time Period** | | | | | |
| Fall-Winter | NSV-6 | 10/18/2002 | 0.001 U | 0.05 | <0.001 |
| | | 10/28/2003 | 0.001 J- | 0.15 | <0.001 |
| | | 10/17/2006 | 0.0013 B | 0.93 | 0.007 |
| **Post-NTCRA Time Period** | | | | | |
| Fall-Winter | NSV-6 | 9/16/2008 | 0.0016 B | 0.46 | 0.004 |
| | | 9/14/2010 | 0.0012 B | 0.19 | 0.001 |
| | | 11/11/2010 | 0.0014 B | 0.39 | 0.003 |
| | | 9/12/2015 | 0.00062 U | 0.14 | <0.001 |
| | | 11/5/2015 | 0.00062 U | 0.29 | <0.001 |
| | | 11/8/2016 | 0.0011 J | 0.56 | 0.003 |
| | | 11/13/2017 | 0.0004 J | 0.35 | 0.001 |
| | | 10/22/2018 | 0.0004 J | 0.20 | 0.000 |
| | | 11/7/2019 | 0.0004 J | Frozen - not measured | -- |
| **Pre-NTCRA Time Period** | | | | | |
| Spring-Summer | NSV-6 | 5/15/2002 | 0.001 B | 0.82 | 0.004 |
| | | 5/24/2003 | 0.001 U | 0.05 | <0.001 |
| | | 7/22/2004 | 0.00043 B | 0.27 | <0.001 |
| **Post-NTCRA Time Period** | | | | | |
| Spring-Summer | NSV-6 [a] | 6/19/2008 | 0.0067 | 2.77 | 0.100 |
| | | 6/2/2009 | 0.0061 | 7.44 | 0.245 |
| | | 6/7/2010 | 0.0116 | 1.54 | 0.096 |
| | | 6/14/2011 | 0.0437 | 7.19 | 1.696[a] |
| | | 5/11/2012 | 0.0093 | 1.18 | 0.059 |
| | | 5/21/2013 | 0.0229 | 1.74 | 0.215 |
| | | 5/20/2014 | 0.0104 | 1.77 | 0.099 |
| | | 8/14/2014 | 0.0019 J | 0.29 | 0.003 |
| | | 7/21/2015 | 0.0015 J | 0.56 | 0.005 |
| | | 5/18/2016 | 0.0057 | 3.72 | 0.114 |
| | | 5/15/2017 | 0.0022 | 7.57 | 0.090 |
| | | 5/18/2018 | 0.005 | 3.78 | 0.102 |
| | | 5/21/2019 | 0.0053 | 5.26 | 0.150 |

**Note**: Mass load values are provided only where paired Total Selenium and Flow data are available.

[a] The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for NSV-6 (spring-summer season).

Definitions for lab and validation qualifiers:

B : Detected at a value between Method Detection Limit and Practical Quantification Limit

J : Estimated value        J-: Estimated value potentially biased low

U : Not detected above the Method Detection Limit

mg/L = milligrams per liter        cfs = cubic feet per second        lbs/day = pounds per day

## Table D-7. Selenium Mass Load Data for Lower Sage Valley (LSV-1)

| Season | Monitoring Location | Date | Total Selenium (mg/L) | Flow (cfs) | Selenium Mass Load (lbs/day) |
|---|---|---|---|---|---|
| **Pre-NTCRA Time Period** | | | | | |
| Fall-Winter | LSV-1 | 10/17/2002 | 0.001 U | 0.25 | 0.001 |
| | | 10/27/2003 | 0.0013 | 0.60 | 0.004 |
| | | 10/17/2006 | 0.0012 B | 2.57 | 0.017 |
| **Post-NTCRA Time Period** | | | | | |
| Fall-Winter | LSV-1 | 9/17/2008 | 0.0014 B | 4.06 | 0.031 |
| | | 11/20/2009 | 0.00092 B | 2.79 | 0.014 |
| | | 9/14/2010 | 0.00062 B | 1.46 | 0.005 |
| | | 11/13/2010 | 0.00054 B | 2.87 | 0.008 |
| | | 11/10/2011 | 0.00049 B | 4.64 | 0.012 |
| | | 11/15/2012 | 0.00065 J | 0.87 | 0.003 |
| | | 11/14/2013 | 0.00043 J | 1.60 | 0.004 |
| | | 11/17/2014 | 0.00072 J | 2.19 | 0.008 |
| | | 9/10/2015 | 0.00062 U | 4.08 | 0.014 |
| | | 11/4/2015 | 0.00062 U | 2.92 | 0.010 |
| | | 11/8/2016 | 0.00069 J | 3.58 | 0.013 |
| | | 11/14/2017 | 0.0006 J | 4.43 | 0.014 |
| | | 10/24/2018 | 0.0005 J | 3.09 | 0.008 |
| | | 11/6/2019 | 0.0005 J | 3.30 | 0.009 |
| **Pre-NTCRA Time Period** | | | | | |
| Spring-Summer | LSV-1 | 5/16/2002 | 0.001 U | 1.88 | 0.010 |
| | | 5/22/2003 | 0.001 U | 0.82 | 0.004 |
| | | 5/8/2004 | 0.002 J- | 1.6 | 0.017 |
| | | 7/21/2004 | 0.0036 | 1.4 | 0.027 |
| **Post-NTCRA Time Period** | | | | | |
| Spring-Summer | LSV-1 [a] | 5/31/2009 | 0.0019 B | 22.27 | 0.228 |
| | | 6/6/2010 | 0.0015 B U | 16.41 | 0.133 |
| | | 6/14/2011 | 0.006 | 54.67 | 1.769[a] |
| | | 5/10/2012 | 0.0011 J | 10.86 | 0.064 |
| | | 5/20/2013 | 0.0041 | 11.41 | 0.252 |
| | | 5/19/2014 | 0.0015 J | 22.17 | 0.179 |
| | | 8/13/2014 | 0.00057 J | 1.59 | 0.005 |
| | | 5/7/2015 | 0.0014 J | 19.39 | 0.146 |
| | | 7/22/2015 | 0.00062 U | 8.46 | 0.028 |
| | | 5/17/2016 | 0.0012 J | 23.45 | 0.152 |
| | | 5/16/2017 | 0.0008 J | 43.79 | 0.189 |
| | | 8/1/2017 | 0.001 J | 6.24 | 0.034 |
| | | 5/16/2018 | 0.0012 J | 28.73 | 0.186 |
| | | 8/8/2018 | 0.0007 J | 6.04 | 0.023 |
| | | 5/22/2019 | 0.0013 J | 21.61 | 0.152 |
| | | 8/14/2019 | 0.0007 J | 6.13 | 0.023 |

**Note**: Mass load values are provided only where paired Total Selenium and Flow data are available.

[a] The June 14, 2011 sample was collected at a time when the creek bypass pipeline was not functioning as designed; therefore, the result associated with this sample is not considered representative of typical post-NTRCRA conditions and the result has been excluded from statistical comparison tests performed for LSV-6 (spring-summer season).

B : Detected at a value between Method Detection Limit and Practical Quantification Limit

J : Estimated value J-: Estimated value potentially biased low

U : Not detected above the Method Detection Limit

mg/L = milligrams per liter cfs = cubic feet per second lbs/day = pounds per day

# APPENDIX E

## Water-Balance and Mass-Balance Comparison

# APPENDIX E

# WATER-BALANCE AND MASS-BALANCE COMPARISON

The annual water-balance and mass-balance comparison is based on modeled water inflows to and outflows from the Pole Canyon ODA. The mass-balance is based on the water-balance model, but also considers selenium concentration data to compute the total annual selenium load (pounds per year) released from the ODA to the environment along the three primary transport pathways: lower Pole Canyon Creek flow (surface water), alluvial groundwater flow, and Wells Formation groundwater flow.

The water-balance and selenium mass-balance models described in the following sections are based on previous models developed for the Pole Canyon ODA. The first model was created in 2004 and 2005 for the Site Investigation Report (NewFields 2005), and used data collected in 2004 to create a month-by-month accounting of water and selenium transport from the Pole Canyon ODA. The water-balance and mass-balance models were revised and updated for the Site-wide water-balance model (NewFields 2009a), and further refined for the RI (Formation 2014).

The inputs and assumptions for the water-balance and mass-balance models developed to evaluate 2019 conditions are described in the following sections. The approach used for 2019 is consistent with the previous modeling work completed for the Site; except for refinements of infiltration estimates (updated methods for creating air temperature and precipitation data for model input).

## E.1 Water-Balance Inflows

Before the 2006 NTCRA was constructed, there were three primary inflow pathways for water to enter the Pole Canyon ODA:

- Upper Pole Canyon Creek flow
- Direct infiltration
- Run-on from the 95-acre upslope area due north of the ODA

In 2007, two components of the 2006 NTCRA were constructed, the creek bypass pipeline and the infiltration basin, which eliminated the inflow from upper Pole Canyon. Therefore, after 2007 there were two primary pathways for water to enter the Pole Canyon ODA:

- Direct infiltration
- Run-on from the 95-acre upslope area due north of the ODA

In 2008, the run-on control channel was constructed as part of the 2006 NTCRA to eliminate run-on from the 95-acre upslope area immediately north of the ODA (Figure E-1). Thus, direct infiltration was the only remaining primary pathway for water to enter the Pole Canyon ODA after completion of the 2006 NTCRA.

In 2010, the south end of Panel A was reclaimed and runoff from this area (Figure E-1) was directed south and into a ditch adjacent to the haul road that crossed the top surface of the Pole Canyon ODA. Run-on from this Panel A storm water collection ditch represented an additional inflow to the Pole Canyon ODA from 2011 through 2014. In 2015, as part of construction of the 2013 NTCRA, the run-on from Panel A was redirected to an infiltration basin located on the west side of the Pole Canyon ODA. This new configuration directs the relatively clean storm water into the Wells Formation without contact with the ODA material. Beginning in 2016, the Panel A storm water was eliminated as an inflow for the “with NTCRAs” scenario.

The native materials in Pole Canyon are thin colluvial deposits overlying highly permeable, unsaturated, Wells Formation sandstone/limestone. The depth to groundwater in the Wells Formation is more than 300 feet below the bottom of the Pole Canyon ODA. Therefore, the Wells Formation is not a source of inflow water to the ODA. Due to the geology of Pole Canyon, lateral inflows from native material to the Pole Canyon ODA are considered to be negligible.

Figure E-2 illustrates the conceptual water-balance model developed for both the “with NTCRAs” and “without NTCRAs” scenarios and identifies each source of water inflow to the Pole Canyon ODA and each pathway for water outflow from the Pole Canyon ODA under these scenarios.

<u>2019 Water-Balance Model Inflow Assumptions</u>

Each annual water-balance model uses data collected during the 12-month period from December 1 through November 30; this approach accounts for the effects of snow that accumulates in December but does not melt for several weeks or months.

Based on the above narrative, the “without NTCRAs” water-balance assumes no actions at the Pole Canyon ODA but includes the reclamation activities at Panel A to provide a theoretical baseline scenario. The total inflow for the “without NTCRAs” water balance is described by the following:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Upper Pole Canyon Creek Flow | + | Run-on from Panel A Storm Water Collection Ditch | + | Direct Infiltration | + | Run-on from Upslope Area Due North of ODA | = | Total Inflow |

The 2019 “with NTCRAs” water-balance model, assumes that the combination of the 2006 NTCRA and the 2013 NTCRA eliminates all inflows to the ODA except for direct infiltration which is now decreased due to construction of the Dinwoody/Chert cover system. Therefore, the “with NTCRAs” total inflow is equal to the annual volume of direct infiltration.

The methods and specific assumptions used to estimate the annual inflow associated with each source of water to the ODA are discussed in the following sections.

### E.1.1 Upper Pole Canyon Creek Flow

The upper Pole Canyon Creek watershed covers an area of 1,102 acres upstream of the ODA (Figure E-1). Runoff from the watershed collects in Pole Canyon Creek and flows toward the ODA. Before the 2006 NTCRA was constructed, the creek entered the ODA where the native stream bed intercepted the base of the placed overburden material at the upper end. The inlet to the creek bypass pipeline installed as part of the 2006 NTCRA is located upstream from the ODA, capturing the creek flow and runoff from the upper portion of the watershed, and conveying it around the ODA. Runoff generated in the portion of the watershed between the pipeline inlet and the ODA flows overland to the infiltration basin where it is directed into the underlying Wells Formation bedrock without contacting ODA material. Based on routine observations and inspections of the 2006 NTCRA components, along with a geophysical study (Willowstick Technologies 2012) performed after construction of the 2006 NTCRA, these features are operating as designed.

The annual volume of water directed to the bypass pipeline in 2019 was computed using flow data collected at the pipeline inlet weir (UP-PD). It should be noted that the volume of water directed to the bypass pipeline was estimated in 2019. The UP-PD transducer failed March 2019 due to ice buildup over the winter. The transducer was replaced in June and data indicates that the vent line was plugged. The missing or inaccurate data were estimated based on historical data from 2015-2017 at the UP-PD transducer station. For years where the UP-PD transducer and the pipeline outlet (LP-PD) transducer both had complete datasets, the cumulative flow at UP-PD was approximately 92 to 94 percent of the LP-PD cumulative flow. Using this information, the 2019 cumulative flow at UP-DP was estimated as 90 percent of LP-PD cumulative flow. This volume is used as the Upper Pole Canyon creek flow into the ODA for the “without-NTCRA” scenario and provides a conservative estimate of NTCRA effectiveness.

The total 2019 annual runoff directed to the infiltration basin was estimated using flow measurements at the flume installed upgradient/upstream of the infiltration basin at station UP-IN and a modeled estimate of annual runoff reporting directly to the infiltration basin immediately downstream of the UP-IN monitoring station.

<u>Water-Balance Model Assumptions:</u>

- Runoff from the uppermost 615 acres of the watershed is diverted around the ODA through the bypass pipeline.

- Runoff from the remaining 487 acres, between the pipeline inlet and the infiltration basin, is directed to the infiltration basin where it infiltrates to the underlying Wells Formation.

- Runoff from 277 acres flows directly to the infiltration basin without passing through the UP-IN flume. The annual volume of runoff from this area is estimated using the HELP3 model for undisturbed, natural ground.

- Gaining conditions from shallow groundwater to Pole Canyon Creek are considered negligible due to the native geology of the canyon.

- The "without NTCRAs" scenario assumes runoff from the entire 1,102-acre watershed enters the Pole Canyon ODA.

- The "with NTCRAs" scenario assumes zero runoff from the 1,102-acre watershed enters the Pole Canyon ODA.

### E.1.2 Direct Infiltration

The direct infiltration pathway utilizes a portion of the annual precipitation that falls onto the Pole Canyon ODA and infiltrates below the evapotranspiration (ET) zone. The fraction of precipitation that infiltrates beyond the ET zone is dependent on many factors including daily meteorological conditions, soil properties, vegetation properties, slope, and aspect.

The annual infiltration volume is estimated using the HELP3 model (Schroeder et al. 1994). The HELP3 model has been used in previous investigations to estimate infiltration rates at the Smoky Canyon Mine, including the initial Pole Canyon ODA water-balance and mass-balance models (NewFields 2004), the Site Investigation (NewFields 2005), the RI (Formation 2014), the Panels B & C Supplemental Environmental Impact Statement (SEIS) (BLM and USFS 2002), and the Panels F & G Environmental Impact Statement (EIS) (BLM and USFS 2007; Knight Piésold 2005). Many of the HELP3 model inputs adopted for the annual water-balance model are based on previous modeling activities (refer to Attachment E-1 for HELP3 model input and output). As noted above, refinements to the water-balance and mass-balance modeling have been incorporated into the infiltration estimates and use information available from other sources including site-specific data collected for the Deep Dinwoody cover lysimeter study at Panel E.

<u>Water-Balance Model Assumptions:</u>

- The area of the Pole Canyon ODA is 120 acres, which is graded to allow runoff off from the new Dinwoody/Chert cover system.

- The vegetation growing season extends from the end of May through the end of August.

- The soil curve number of 86 was used for consistency with the RI (Formation 2014).

- The “without NTCRAs” scenario assumes direct vegetation of overburden material with the vegetation in poor condition.

- The “with NTCRAs” scenario assumes a cover of three feet of Dinwoody Formation material over two feet of chert with the vegetation in fair condition.

### E.1.3 Run-On from Upslope Area Due North of the ODA

Run-on from the upslope area includes runoff from the approximately 95 acres, north of the Pole Canyon ODA, that flows toward the ODA during spring snowmelt and storm events (Figure E-1). Run-on from this upslope area was modeled as undisturbed natural ground using HELP3 (refer to Attachment E-1 for HELP3 model output).

Water-Balance Model Assumptions:

- The “without NTCRAs” scenario assumes all estimated run-on from the upslope area, north of the ODA, enters the Pole Canyon ODA.

- The “with NTCRAs” scenario assumes the run-on control channel eliminates the inflow pathway from the 95-acre upslope area by intercepting and redirecting run-on around the Pole Canyon ODA.

### E.1.4 Run-On from Panel A Storm Water Collection Ditch Crossing ODA

Prior to construction of the 2013 NTCRA Dinwoody/Chert cover system in 2015, runoff from the reclaimed area of Panel A was directed into a storm water collection ditch adjacent to the haul road that crossed the top surface of the Pole Canyon ODA. Depending on the magnitude of flow, some or all of this water infiltrated into the Pole Canyon ODA. The geophysical study, performed in June 2012 (Willowstick Technologies 2012), showed areas where water in the Panel A ditch infiltrated into the ODA. Observations by Mine personnel indicated that there was typically significant flow lost as the runoff flowed across the Pole Canyon ODA. The new (2013 NTCRA) configuration of the run-on controls directs the relatively clean storm water from Panel A into the Wells Formation without contacting ODA material.

Water-Balance Model Assumptions:

- The area of Panel A contributing runoff to the collection ditch is 105 acres.

- The Panel A reclamation consisted of regrading overburden material and placing a six-inch topsoil cover (this cover configuration was used to model runoff from Panel A in HELP3, Appendix E).

- The “without NTCRAs” scenario assumes approximately 75 percent of the runoff from Panel A infiltrates into the Pole Canyon ODA.

- The “with NTCRAs” scenario assumes the new run-on controls eliminate the Panel A storm water inflow (and infiltration) to the ODA.

## E.2 Water-Balance Outflows

The total annual outflow volume equals the total estimated annual inflow to the Pole Canyon ODA, as discussed in Section E.1. This approach assumes no change to net storage of water in the Pole Canyon ODA over the 12-month period from December 1, 2018 through November 30, 2019.

Water can exit the Pole Canyon ODA via three primary flow pathways:

- Direct discharge to surface water in lower Pole Canyon

- Vertical infiltration to the alluvial groundwater beneath the ODA

- Vertical infiltration to the Wells Formation groundwater beneath the ODA.

The water-balance model requires estimation of the annual outflow for each pathway. Water leaving the Pole Canyon ODA via the surface water pathway to lower Pole Canyon Creek is measured directly at LP-1. The volume of water leaving via the groundwater pathways is estimated.

<u>Water-Balance Model Assumptions:</u>

- Both water-balance scenarios assume 37 percent of total inflow volume infiltrates to the Wells Formation via the groundwater pathway.

- The “without NTCRAs” scenario calculates the volume of water leaving the ODA via the alluvial groundwater and the surface water pathway using the assumptions developed for the Final RI Report (Formation 2014):

    - Flow to the alluvial groundwater system is an estimated maximum annual volume of 65 acre-feet, limited by the physical dimensions of the alluvium (i.e., saturated thickness and width) and hydraulic characteristics (i.e., gradient and hydraulic conductivity) at the toe of the Pole Canyon ODA.

    - The remainder of the inflow volume (after subtracting water to the Wells Formation and the alluvium) is assumed to leave the ODA via the surface water flow pathway to lower Pole Canyon Creek.

- The “with NTCRAs” scenario calculates the annual outflows from the Pole Canyon ODA with the following assumptions:

    - The surface water flow pathway is calculated using the continuous flow data collected at LP-1.

    - The remainder of the inflow volume (after removing water to the Wells Formation and surface water) is assumed to leave the ODA via the alluvial groundwater flow pathway.

## E.3 Mass-Balance Description

The selenium mass-balance model is based on the water-balance model described above, but also includes selenium mass loading estimates for each of the three primary outflow pathways from the Pole Canyon ODA (i.e., surface water via lower Pole Canyon Creek, alluvial groundwater, and Wells Formation groundwater). The selenium mass load associated with each pathway is based on the annual water flux estimated using the water balance and measured or estimated selenium concentrations.

The selenium concentration in water leaving the Pole Canyon ODA as surface water can be measured directly at LP-1. Figure E-3 shows the selenium concentrations measured at LP, LP-1, and LP-PD from 2003 through 2019. Although the selenium concentrations measured at LP-1 have increased, the magnitude and the duration of flow at LP-1 have generally decreased since the 2006 NTCRA was implemented.

A time-varying selenium source concentration function was developed using empirical data from column leach test results conducted for the Panels F & G EIS modeling effort (BLM and USFS 2007). The source concentration function was used to calculate the mass of selenium leached from overburden by water moving through the material via the direct infiltration pathway. Over time, the mass available for transport from the overburden attenuates and consequently the theoretical groundwater concentrations decrease each year. This approach to estimate the average annual selenium concentration in groundwater outflows is consistent with the Final RI Report (Formation 2014).

<u>Mass-Balance Model Assumptions:</u>

- The average selenium concentration measured at LP-1 was 1.1 mg/L between 2003 and 2007. This is the assumed average annual selenium concentration in outflow surface water for the “without NTCRAs” scenario.

- The estimated average annual selenium concentration in outflow surface water for the “with NTCRAs” scenario is typically based on a flow-weighted average concentration from samples collected during the spring (April through June). For 2019, the annual average selenium concentration for surface water flowing from the ODA is the same as the concentration for the spring 2019 LP-1 sample (4.69 mg/L). This is the time of the year when the vast majority of flow occurs.

- The empirically based source concentration function assumes that the overburden was placed in 1985. Using the function, the selenium source concentration in groundwater for 2019 is 0.43 mg/L for both “with NTCRAs” and “without NTCRAs” scenarios.

## E.4 References

Bureau of Land Management and USDA Forest Service (BLM and USFS). 2002. Final Supplemental Environmental Impact Statement: Smoky Canyon Mine, Panels B & C. US Department of Interior, Bureau of Land Management, Pocatello Field Office, Pocatello, Idaho. US Department of Agriculture, Forest Service, Caribou National Forest. April.

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Willowstick Technologies, LLC. 2012. Willowstick Investigation of the Smoky Canyon Mine Pole Canyon ODA. Prepared for J.R. Simplot Company. October.

FIGURES

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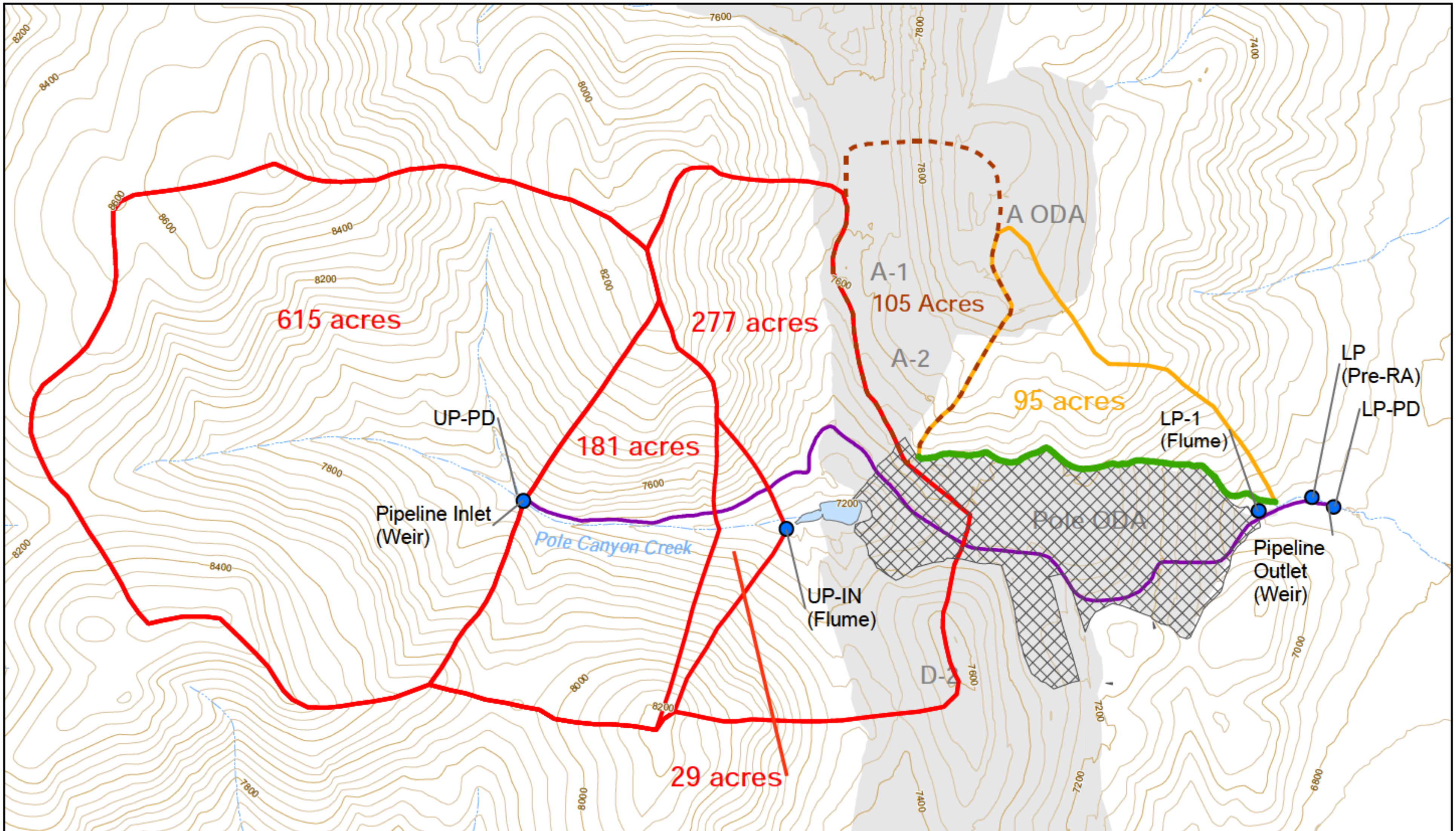


Legend

- Flume and Weir Locations
- Drainage Area for Runoff from Panel A Reclaimed Area
- Pole Canyon ODA 2013 NTCRA Cover Area
- Upper Pole Canyon Creek Watershed
- Run-on Control Channel Watershed
- Bypass Pipeline (2006 NTCRA)
- Run-on Control Channel (2006 NTCRA)
- Sedimentation/Infiltration Basin (2006 NTCRA)
- Mine Disturbance Areas

NTCRA = Non-Time-Critical Removal Action

N

0 1,000 2,000

Feet

J.R. SIMPLOT COMPANY

SMOKY CANYON MINE

2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE E-1

UPPER POLE CANYON CREEK WATERSHED AND 2006 NTCRA COMPONENTS

DATE: JUN 22, 2020

BY: CRL

FOR: ACK

FORMATION ENVIRONMENTAL

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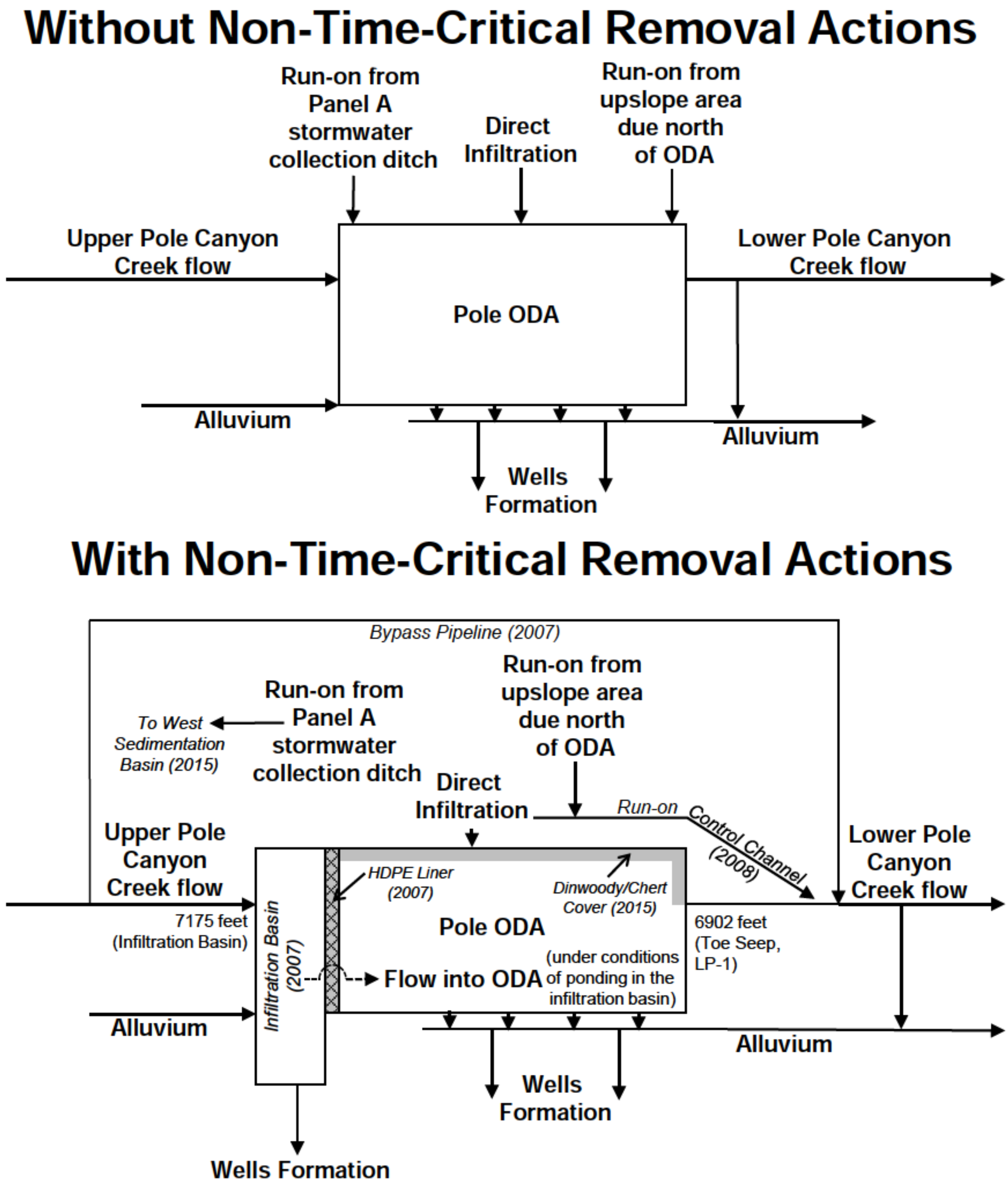



Notes:

1. The "Without Non-Time-Critical Removal Actions" model represents the model inputs/outputs before the Removal Actions were constructed or if the Removal Actions had not been constructed (i.e., the "no action" scenario).
2. The "With Non-Time-Critical Removal Actions" model represents the model inputs/outputs after the Removal Actions were constructed (i.e., the "as-built" scenario).
3. The Non-Time-Critical Removal Action components are in italics with the year of construction in parentheses.
4. There is an impermeable barrier between the infiltration basin and the Pole Canyon ODA, which greatly limits surface or alluvial water in the upper Pole Canyon Creek drainage from entering the ODA.

**J.R. SIMPLOT COMPANY**
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

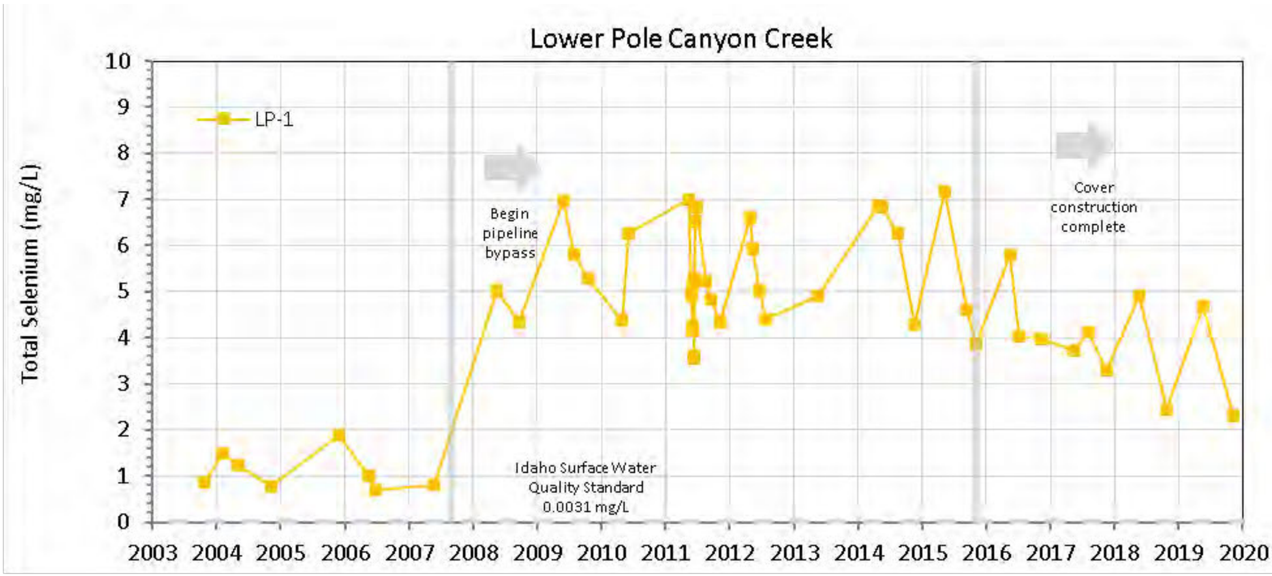
FIGURE E-2

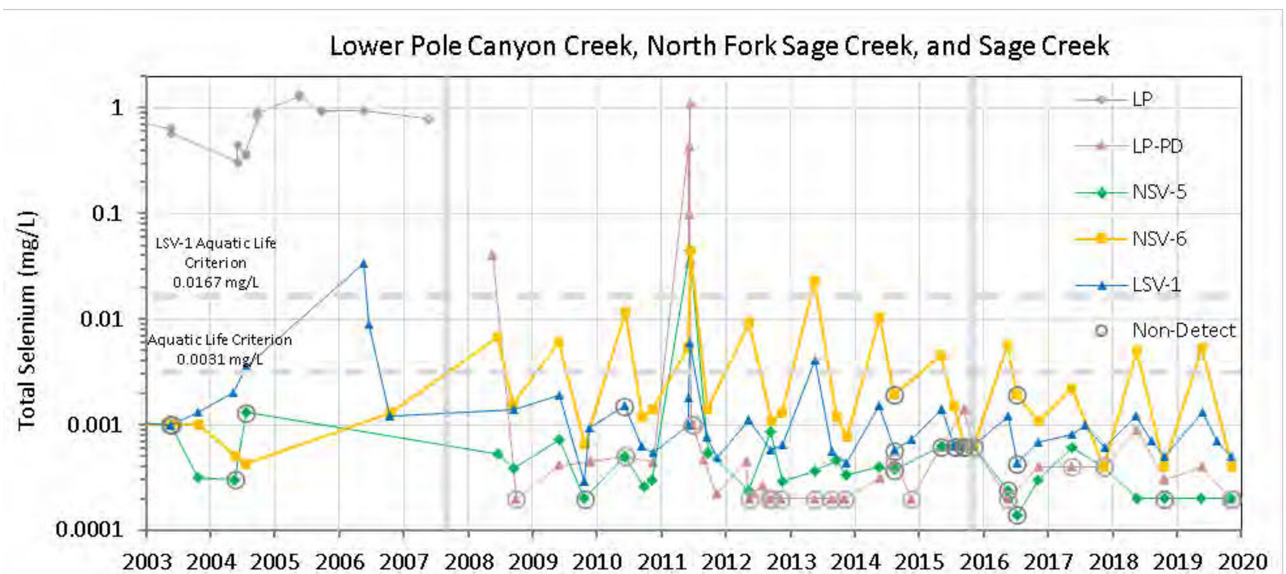
**WATER BALANCE CONCEPTUAL MODEL**

DATE: JULY 2020
BY: LJM
FOR: ACK

FORMATION ENVIRONMENTAL

"S:\JOBS\SMOKY\CERCLA\POLENTCRA\ANNRPT\2019\DRAFT\APPENDICES\APPXEHELP\APPE_FIGS PPTX"




**J.R. SIMPLOT COMPANY**
SMOKY CANYON MINE
2019 PERFORMANCE AND EFFECTIVENESS MONITORING REPORT

FIGURE E-3

**TOTAL SELENIUM CONCENTRATIONS IN LOWER POLE CANYON CREEK, NORTH FORK SAGE CREEK, AND SAGE CREEK**

DATE: JULY 2020
BY: WSB
FOR: ACK

FORMATION ENVIRONMENTAL

"S:\Jobs\Smoky\CERCLA\PoleNTCRA\AnnRpt\2019\Draft\Figs\SeTimeseries_2019.xlsx"

# ATTACHMENT E-1

## HELP3 Model Output

**Pole Canyon ODA 2015 - 2019**

**Exposed Overburden Pile**

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**           HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                  **
**             HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                   **
**               DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                 USAE WATERWAYS EXPERIMENT STATION                        **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                 **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\PREC8419.D4
TEMPERATURE DATA FILE:      \TEMP8419.D7
SOLAR RADIATION DATA FILE:  \SOL8419.D13
EVAPOTRANSPIRATION DATA:    \EOPEVAPO.D11
SOIL AND DESIGN DATA FILE:  \EOPSOIL.D10
OUTPUT DATA FILE:           C:\EOPOUT19.OUT


TIME:  19:10     DATE:   6/ 1/2020


******************************************************************************

     TITLE: Exposed Overburden Pile

******************************************************************************


     NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   0
          THICKNESS                   =     24.00   INCHES
```





```
          POROSITY                    =      0.3650 VOL/VOL
          FIELD CAPACITY              =      0.2390 VOL/VOL
          WILTING POINT               =      0.1020 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.1453 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   = 0.260000005000E-01 CM/SEC




                  GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                  ----------------------------------------

        NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

       SCS RUNOFF CURVE NUMBER            =    86.00
       FRACTION OF AREA ALLOWING RUNOFF   =   100.0    PERCENT
       AREA PROJECTED ON HORIZONTAL PLANE =     1.000  ACRES
       EVAPORATIVE ZONE DEPTH             =    24.0    INCHES
       INITIAL WATER IN EVAPORATIVE ZONE  =     3.488  INCHES
       UPPER LIMIT OF EVAPORATIVE STORAGE =     8.760  INCHES
       LOWER LIMIT OF EVAPORATIVE STORAGE =     2.448  INCHES
       INITIAL SNOW WATER                 =     3.576  INCHES
       INITIAL WATER IN LAYER MATERIALS   =     3.488  INCHES
       TOTAL INITIAL WATER                =     7.064  INCHES
       TOTAL SUBSURFACE INFLOW            =     0.00   INCHES/YEAR


                   EVAPOTRANSPIRATION AND WEATHER DATA
                   -----------------------------------

        NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                 POCATELLO             IDAHO

            STATION LATITUDE                     = 42.68 DEGREES
            MAXIMUM LEAF AREA INDEX              =   1.50
            START OF GROWING SEASON (JULIAN DATE) =   150
            END OF GROWING SEASON (JULIAN DATE)   =   240
            EVAPORATIVE ZONE DEPTH               =  24.0  INCHES
            AVERAGE ANNUAL WIND SPEED            =   3.60 MPH
            AVERAGE 1ST QUARTER RELATIVE HUMIDITY =  69.70 %
            AVERAGE 2ND QUARTER RELATIVE HUMIDITY =  54.70 %
            AVERAGE 3RD QUARTER RELATIVE HUMIDITY =  45.10 %
            AVERAGE 4TH QUARTER RELATIVE HUMIDITY =  67.70 %


        NOTE:  PRECIPITATION DATA FOR     SMOKY CANYON MINE          IDAHO
```

WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR SMOKY CANYON MINE IDAHO
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO
AND STATION LATITUDE = 42.68 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2015

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 1.38 | 2.23 | 1.01 | 2.57 | 4.74 | 1.37 |
| | 1.80 | 0.96 | 2.54 | 0.64 | 3.17 | 3.86 |
| RUNOFF | 0.137 | 2.664 | 0.264 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.009 | 0.000 | 0.000 | 0.210 |
| EVAPOTRANSPIRATION | 0.299 | 0.319 | 0.909 | 2.490 | 3.998 | 1.850 |
| | 1.847 | 1.000 | 1.710 | 0.548 | 0.535 | 0.299 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 3.1001 | 0.0927 | 0.5605 | 0.0621 |
| LAYER 1 | 0.0103 | 0.0003 | 0.6064 | 0.0787 | 0.6722 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2015

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 26.27 | 95360.148 | 100.00 |





| | | | |
|---|---|---|---|
| RUNOFF | 3.283 | 11918.670 | 12.50 |
| EVAPOTRANSPIRATION | 15.804 | 57370.199 | 60.16 |
| PERC./LEAKAGE THROUGH LAYER 1 | 5.183189 | 18814.977 | 19.73 |
| CHANGE IN WATER STORAGE | 1.999 | 7256.240 | 7.61 |
| SOIL WATER AT START OF YEAR | 5.075 | 18423.260 | |
| SOIL WATER AT END OF YEAR | 4.145 | 15044.675 | |
| SNOW WATER AT START OF YEAR | 0.948 | 3440.371 | 3.61 |
| SNOW WATER AT END OF YEAR | 3.877 | 14075.196 | 14.76 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.068 | 0.00 |

*******************************************************************************

*******************************************************************************

MONTHLY TOTALS (IN INCHES) FOR YEAR 2016

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.41 | 1.98 | 3.63 | 2.15 | 3.60 | 0.40 |
| | 0.16 | 0.00 | 4.22 | 6.24 | 1.28 | 2.83 |
| RUNOFF | 0.000 | 0.727 | 4.584 | 2.990 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.022 | 0.094 | 0.000 | 0.493 |
| EVAPOTRANSPIRATION | 0.208 | 0.324 | 0.289 | 1.919 | 3.458 | 0.660 |
| | 0.193 | 0.007 | 2.002 | 1.807 | 0.938 | 0.222 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 4.2391 | 0.1556 | 0.0171 |
| LAYER 1 | 0.0193 | 0.0000 | 1.1085 | 4.0558 | 0.4922 | 0.1786 |

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ANNUAL TOTALS FOR YEAR 2016

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 28.90 | 104906.992 | 100.00 |
| RUNOFF | 8.910 | 32343.643 | 30.83 |
| EVAPOTRANSPIRATION | 12.028 | 43661.648 | 41.62 |
| PERC./LEAKAGE THROUGH LAYER 1 | 10.266080 | 37265.871 | 35.52 |
| CHANGE IN WATER STORAGE | -2.304 | -8364.133 | -7.97 |
| SOIL WATER AT START OF YEAR | 4.145 | 15044.675 | |
| SOIL WATER AT END OF YEAR | 3.919 | 14224.420 | |
| SNOW WATER AT START OF YEAR | 3.877 | 14075.196 | 13.42 |
| SNOW WATER AT END OF YEAR | 1.799 | 6531.319 | 6.23 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.038 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2017

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 4.63 | 5.97 | 2.27 | 4.34 | 2.02 | 0.93 |
| | 0.34 | 1.74 | 3.25 | 0.24 | 3.85 | 1.80 |
| RUNOFF | 0.000 | 4.102 | 5.915 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.019 |
| EVAPOTRANSPIRATION | 0.252 | 0.182 | 0.798 | 2.624 | 3.027 | 0.955 |
| | 0.384 | 1.593 | 1.882 | 1.054 | 0.786 | 0.441 |





| | | | | | | |
|---|---|---|---|---|---|---|
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 3.9246 | 1.1150 | 0.3669 | 0.0534 |
| LAYER 1 | 0.0016 | 0.0004 | 0.4055 | 0.2002 | 2.1059 | 0.2210 |

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ANNUAL TOTALS FOR YEAR 2017

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 31.38 | 113909.391 | 100.00 |
| RUNOFF | 10.036 | 36431.254 | 31.98 |
| EVAPOTRANSPIRATION | 13.979 | 50744.676 | 44.55 |
| PERC./LEAKAGE THROUGH LAYER 1 | 8.394346 | 30471.477 | 26.75 |
| CHANGE IN WATER STORAGE | -1.030 | -3737.976 | -3.28 |
| SOIL WATER AT START OF YEAR | 3.919 | 14224.420 | |
| SOIL WATER AT END OF YEAR | 3.687 | 13384.958 | |
| SNOW WATER AT START OF YEAR | 1.799 | 6531.319 | 5.73 |
| SNOW WATER AT END OF YEAR | 1.001 | 3632.805 | 3.19 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.042 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2018

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.22 | 3.00 | 2.85 | 3.39 | 1.58 | 0.77 |
| | 0.64 | 0.69 | 0.19 | 1.60 | 2.73 | 1.45 |

| | | | | | | |
|---|---|---|---|---|---|---|
| RUNOFF | 0.476 | 0.582 | 3.496 | 2.943 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.355 | 0.254 | 0.314 | 0.798 | 1.981 | 0.785 |
| | 0.519 | 0.843 | 0.012 | 1.597 | 0.439 | 0.385 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 3.9047 | 0.0516 | 0.0023 |
| LAYER 1 | 0.0000 | 0.0000 | 0.0004 | 0.0025 | 0.0029 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2018

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 21.11 | 76629.312 | 100.00 |
| RUNOFF | 7.497 | 27213.945 | 35.51 |
| EVAPOTRANSPIRATION | 8.284 | 30069.250 | 39.24 |
| PERC./LEAKAGE THROUGH LAYER 1 | 3.964448 | 14390.946 | 18.78 |
| CHANGE IN WATER STORAGE | 1.365 | 4955.160 | 6.47 |
| SOIL WATER AT START OF YEAR | 3.687 | 13384.958 | |
| SOIL WATER AT END OF YEAR | 3.423 | 12425.902 | |
| SNOW WATER AT START OF YEAR | 1.001 | 3632.805 | 4.74 |
| SNOW WATER AT END OF YEAR | 2.630 | 9547.020 | 12.46 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.010 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2019





| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.87 | 2.60 | 1.70 | 2.57 | 3.60 | 0.98 |
| | 0.70 | 0.00 | 3.37 | 2.63 | 1.31 | 1.67 |
| RUNOFF | 0.023 | 0.000 | 1.287 | 6.371 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.034 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.324 | 0.222 | 0.361 | 1.039 | 3.047 | 1.097 |
| | 0.690 | 0.072 | 2.400 | 1.474 | 0.813 | 0.363 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 3.6771 | 0.2867 | 0.0617 |
| LAYER 1 | 0.0000 | 0.0000 | 0.2871 | 0.7096 | 0.0320 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2019

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 24.00 | 87119.969 | 100.00 |
| RUNOFF | 7.715 | 28005.811 | 32.15 |
| EVAPOTRANSPIRATION | 11.901 | 43201.734 | 49.59 |
| PERC./LEAKAGE THROUGH LAYER 1 | 5.054185 | 18346.691 | 21.06 |
| CHANGE IN WATER STORAGE | -0.671 | -2434.234 | -2.79 |
| SOIL WATER AT START OF YEAR | 3.423 | 12425.902 | |
| SOIL WATER AT END OF YEAR | 3.077 | 11169.224 | |
| SNOW WATER AT START OF YEAR | 2.630 | 9547.020 | 10.96 |
| SNOW WATER AT END OF YEAR | 2.306 | 8369.465 | 9.61 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.031 | 0.00 |

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 2015 THROUGH 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| **PRECIPITATION** | | | | | | |
| TOTALS | 2.45 | 2.51 | 2.16 | 2.43 | 2.42 | 1.26 |
| | 1.00 | 1.11 | 1.49 | 2.20 | 2.38 | 2.39 |
| STD. DEVIATIONS | 1.03 | 1.57 | 0.86 | 0.99 | 1.09 | 1.08 |
| | 0.95 | 0.88 | 1.12 | 1.21 | 1.11 | 1.31 |
| **RUNOFF** | | | | | | |
| TOTALS | 0.094 | 0.305 | 1.807 | 4.664 | 0.765 | 0.000 |
| | 0.002 | 0.001 | 0.003 | 0.011 | 0.075 | 0.100 |
| STD. DEVIATIONS | 0.240 | 0.807 | 1.820 | 3.076 | 1.726 | 0.000 |
| | 0.012 | 0.003 | 0.007 | 0.045 | 0.254 | 0.212 |
| **EVAPOTRANSPIRATION** | | | | | | |
| TOTALS | 0.285 | 0.273 | 0.404 | 1.010 | 2.160 | 1.393 |
| | 0.959 | 1.047 | 1.221 | 1.087 | 0.554 | 0.317 |
| STD. DEVIATIONS | 0.048 | 0.048 | 0.148 | 0.662 | 0.816 | 1.010 |
| | 0.837 | 0.744 | 0.694 | 0.534 | 0.177 | 0.067 |
| **PERCOLATION/LEAKAGE THROUGH LAYER 1** | | | | | | |
| TOTALS | 0.0000 | 0.0000 | 0.4332 | 1.8539 | 1.5554 | 0.0746 |
| | 0.0386 | 0.0222 | 0.1194 | 0.5336 | 0.5955 | 0.0877 |
| STD. DEVIATIONS | 0.0000 | 0.0000 | 1.1055 | 1.7303 | 1.8926 | 0.2123 |
| | 0.1765 | 0.0973 | 0.2960 | 0.8458 | 0.6471 | 0.3207 |

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2015 THROUGH 2019





| | INCHES | | CU. FEET | PERCENT |
|---|---|---|---|---|
| PRECIPITATION | 23.80 | ( 4.657) | 86408.1 | 100.00 |
| RUNOFF | 7.826 | ( 3.4813) | 28407.28 | 32.876 |
| EVAPOTRANSPIRATION | 10.711 | ( 2.2662) | 38880.08 | 44.996 |
| PERCOLATION/LEAKAGE THROUGH LAYER 1 | 5.31413 | ( 1.62571) | 19290.273 | 22.32462 |
| CHANGE IN WATER STORAGE | -0.047 | ( 2.4306) | -169.52 | -0.196 |

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PEAK DAILY VALUES FOR YEARS 2015 THROUGH 2019

| | (INCHES) | (CU. FT.) |
|---|---|---|
| PRECIPITATION | 2.01 | 7296.300 |
| RUNOFF | 2.189 | 7944.5361 |
| PERCOLATION/LEAKAGE THROUGH LAYER 1 | 4.321451 | 15686.86620 |
| SNOW WATER | 16.97 | 61596.1133 |
| MAXIMUM VEG. SOIL WATER (VOL/VOL) | 0.3139 | |
| MINIMUM VEG. SOIL WATER (VOL/VOL) | 0.1020 | |

*******************************************************************************

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FINAL WATER STORAGE AT END OF YEAR 2019

| LAYER | (INCHES) | (VOL/VOL) |
|---|---|---|

```
             1            3.0769         0.1282

        SNOW WATER       2.306

**************************************************************************
**************************************************************************
```

# Pole Canyon ODA 2015 - 2019

# Pole Canyon Cover

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\PREC8419.D4
TEMPERATURE DATA FILE:      \TEMP8419.D7
SOLAR RADIATION DATA FILE: \SOL8419.D13
EVAPOTRANSPIRATION DATA:    \PCCEVAPO.D11
SOIL AND DESIGN DATA FILE: \PCCSOIL.D10
OUTPUT DATA FILE:           C:\PCCOUT19.OUT


TIME:  18:52     DATE:   6/ 1/2020


******************************************************************************

     TITLE: Pole Canyon Cover: Dinwoody 3ft, Chert 2ft

******************************************************************************


     NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
           COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                 LAYER  1
                                 --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
           THICKNESS                  =    36.00   INCHES
```





```
           POROSITY                   =     0.4910 VOL/VOL
           FIELD CAPACITY             =     0.3000 VOL/VOL
           WILTING POINT              =     0.2000 VOL/VOL
           INITIAL SOIL WATER CONTENT =     0.2983 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  = 0.159999996000E-03 CM/SEC


                                 LAYER  2
                                 --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
           THICKNESS                  =    24.00   INCHES
           POROSITY                   =     0.2380 VOL/VOL
           FIELD CAPACITY             =     0.1300 VOL/VOL
           WILTING POINT              =     0.0700 VOL/VOL
           INITIAL SOIL WATER CONTENT =     0.1198 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  = 0.199999996000E-01 CM/SEC


                                 LAYER  3
                                 --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   0
           THICKNESS                  =    24.00   INCHES
           POROSITY                   =     0.3650 VOL/VOL
           FIELD CAPACITY             =     0.2390 VOL/VOL
           WILTING POINT              =     0.1020 VOL/VOL
           INITIAL SOIL WATER CONTENT =     0.2225 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  = 0.260000005000E-01 CM/SEC


                  GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                  ----------------------------------------

          NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

          SCS RUNOFF CURVE NUMBER            =    86.00
          FRACTION OF AREA ALLOWING RUNOFF   =   100.0    PERCENT
          AREA PROJECTED ON HORIZONTAL PLANE =     1.000 ACRES
          EVAPORATIVE ZONE DEPTH             =    36.0    INCHES
          INITIAL WATER IN EVAPORATIVE ZONE  =    10.740  INCHES
```

```
UPPER  LIMIT  OF  EVAPORATIVE  STORAGE  =  17.676  INCHES
LOWER  LIMIT  OF  EVAPORATIVE  STORAGE  =  7.200  INCHES
INITIAL SNOW WATER                    =    3.576    INCHES
INITIAL  WATER  IN  LAYER  MATERIALS  =  18.956    INCHES
TOTAL INITIAL WATER                   = 22.532  INCHES
TOTAL SUBSURFACE INFLOW               = 0.00  INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

```
NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
         POCATELLO             IDAHO

    STATION LATITUDE                        = 42.68 DEGREES
    MAXIMUM LEAF AREA INDEX                 =   3.00
    START OF GROWING SEASON (JULIAN DATE)   =    150
    END OF GROWING SEASON (JULIAN DATE)     =    240
    EVAPORATIVE ZONE DEPTH                  = 36.0  INCHES
    AVERAGE ANNUAL WIND SPEED               =   3.60 MPH
    AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 69.70 %
    AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 54.70 %
    AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 45.10 %
    AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 67.70 %

NOTE:  PRECIPITATION DATA FOR     SMOKY CANYON MINE           IDAHO

         WAS ENTERED BY THE USER.

NOTE:  TEMPERATURE DATA FOR     SMOKY CANYON MINE           IDAHO
         WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
         COEFFICIENTS FOR    POCATELLO           IDAHO
           AND STATION LATITUDE = 42.68 DEGREES
```

*******************************************************************************





MONTHLY TOTALS (IN INCHES) FOR YEAR 2015

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 1.38 | 2.23 | 1.01 | 2.57 | 4.74 | 1.37 |
| | 1.80 | 0.96 | 2.54 | 0.64 | 3.17 | 3.86 |
| RUNOFF | 0.176 | 2.860 | 0.287 | 0.000 | 0.026 | 0.000 |
| | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.330 |
| EVAPOTRANSPIRATION | 0.299 | 0.319 | 0.816 | 2.490 | 3.641 | 2.369 |
| | 5.506 | 0.965 | 1.349 | 0.709 | 0.525 | 0.299 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 1.6188 | 0.0000 | 0.0000 | 1.5899 |
| LAYER 3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

*******************************************************************************

*******************************************************************************

ANNUAL TOTALS FOR YEAR 2015

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 26.27 | 95360.148 | 100.00 |
| RUNOFF | 3.693 | 13406.745 | 14.06 |
| EVAPOTRANSPIRATION | 19.287 | 70011.602 | 73.42 |
| PERC./LEAKAGE THROUGH LAYER 3 | 3.208682 | 11647.514 | 12.21 |
| CHANGE IN WATER STORAGE | 0.081 | 294.212 | 0.31 |
| SOIL WATER AT START OF YEAR | 21.237 | 77091.875 | |
| SOIL WATER AT END OF YEAR | 18.389 | 66751.258 | |
| SNOW WATER AT START OF YEAR | 0.948 | 3440.371 | 3.61 |
| SNOW WATER AT END OF YEAR | 3.877 | 14075.196 | 14.76 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.074 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2016

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.41 | 1.98 | 3.63 | 2.15 | 3.60 | 0.40 |
| | 0.16 | 0.00 | 4.22 | 6.24 | 1.28 | 2.83 |
| RUNOFF | 0.000 | 0.851 | 4.486 | 2.858 | 0.023 | 0.000 |
| | 0.000 | 0.000 | 0.062 | 0.420 | 0.000 | 0.657 |
| EVAPOTRANSPIRATION | 0.208 | 0.324 | 0.289 | 1.801 | 2.992 | 1.322 |
| | 3.957 | 0.000 | 1.196 | 1.429 | 0.633 | 0.222 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 1.0166 | 1.0203 | 0.0000 |
| LAYER 3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 2.0392 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2016

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 28.90 | 104906.992 | 100.00 |
| RUNOFF | 9.357 | 33965.828 | 32.38 |
| EVAPOTRANSPIRATION | 14.374 | 52176.703 | 49.74 |
| PERC./LEAKAGE THROUGH LAYER 3 | 4.076041 | 14796.029 | 14.10 |
| CHANGE IN WATER STORAGE | 1.093 | 3968.450 | 3.78 |
| SOIL WATER AT START OF YEAR | 18.389 | 66751.258 | |
| SOIL WATER AT END OF YEAR | 21.560 | 78263.586 | |





| | | | |
|---|---|---|---|
| SNOW WATER AT START OF YEAR | 3.877 | 14075.196 | 13.42 |
| SNOW WATER AT END OF YEAR | 1.799 | 6531.319 | 6.23 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.021 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2017

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 4.63 | 5.97 | 2.27 | 4.34 | 2.02 | 0.93 |
| | 0.34 | 1.74 | 3.25 | 0.24 | 3.85 | 1.80 |
| RUNOFF | 0.000 | 4.761 | 6.163 | 0.013 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.019 | 0.055 |
| EVAPOTRANSPIRATION | 0.252 | 0.182 | 0.775 | 2.401 | 2.629 | 1.283 |
| | 4.448 | 1.541 | 1.409 | 1.111 | 0.707 | 0.441 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 2.9436 | 1.1228 | 1.6294 | 0.0000 |
| LAYER 3 | 0.5393 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2017

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 31.38 | 113909.391 | 100.00 |
| RUNOFF | 11.010 | 39966.422 | 35.09 |
| EVAPOTRANSPIRATION | 17.180 | 62362.078 | 54.75 |
| PERC./LEAKAGE THROUGH LAYER 3 | 6.235108 | 22633.443 | 19.87 |

| | | | |
|---|---|---|---|
| CHANGE IN WATER STORAGE | -3.045 | -11052.561 | -9.70 |
| SOIL WATER AT START OF YEAR | 21.560 | 78263.586 | |
| SOIL WATER AT END OF YEAR | 19.314 | 70109.539 | |
| SNOW WATER AT START OF YEAR | 1.799 | 6531.319 | 5.73 |
| SNOW WATER AT END OF YEAR | 1.001 | 3632.805 | 3.19 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.007 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2018

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.22 | 3.00 | 2.85 | 3.39 | 1.58 | 0.77 |
| | 0.64 | 0.69 | 0.19 | 1.60 | 2.73 | 1.45 |
| RUNOFF | 0.709 | 0.798 | 3.692 | 2.989 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.355 | 0.254 | 0.314 | 1.199 | 2.143 | 1.197 |
| | 4.139 | 0.794 | 0.046 | 1.038 | 0.364 | 0.385 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 1.5941 | 0.0000 | 0.0000 |
| LAYER 3 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2018

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|





| | | | |
|---|---|---|---|
| PRECIPITATION | 21.11 | 76629.312 | 100.00 |
| RUNOFF | 8.188 | 29723.291 | 38.79 |
| EVAPOTRANSPIRATION | 12.227 | 44384.871 | 57.92 |
| PERC./LEAKAGE THROUGH LAYER 3 | 1.594145 | 5786.748 | 7.55 |
| CHANGE IN WATER STORAGE | -0.900 | -3265.603 | -4.26 |
| SOIL WATER AT START OF YEAR | 19.314 | 70109.539 | |
| SOIL WATER AT END OF YEAR | 16.785 | 60929.723 | |
| SNOW WATER AT START OF YEAR | 1.001 | 3632.805 | 4.74 |
| SNOW WATER AT END OF YEAR | 2.630 | 9547.020 | 12.46 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.004 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.87 | 2.60 | 1.70 | 2.57 | 3.60 | 0.98 |
| | 0.70 | 0.00 | 3.37 | 2.63 | 1.31 | 1.67 |
| RUNOFF | 0.040 | 0.000 | 1.368 | 5.856 | 0.011 | 0.000 |
| | 0.000 | 0.000 | 0.036 | 0.000 | 0.000 | 0.001 |
| EVAPOTRANSPIRATION | 0.324 | 0.222 | 0.361 | 1.334 | 2.669 | 1.452 |
| | 4.719 | 0.043 | 1.786 | 1.037 | 0.455 | 0.363 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| LAYER 3 | 1.6062 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2019

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 24.00 | 87119.969 | 100.00 |
| RUNOFF | 7.311 | 26539.996 | 30.46 |
| EVAPOTRANSPIRATION | 14.766 | 53599.609 | 61.52 |
| PERC./LEAKAGE THROUGH LAYER 3 | 1.606243 | 5830.664 | 6.69 |
| CHANGE IN WATER STORAGE | 0.317 | 1149.734 | 1.32 |
| SOIL WATER AT START OF YEAR | 16.785 | 60929.723 | |
| SOIL WATER AT END OF YEAR | 17.426 | 63257.012 | |
| SNOW WATER AT START OF YEAR | 2.630 | 9547.020 | 10.96 |
| SNOW WATER AT END OF YEAR | 2.306 | 8369.465 | 9.61 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.031 | 0.00 |

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 2015 THROUGH 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| **PRECIPITATION** | | | | | | |
| TOTALS | 2.45 | 2.51 | 2.16 | 2.43 | 2.42 | 1.26 |
| | 1.00 | 1.11 | 1.49 | 2.20 | 2.38 | 2.39 |
| STD. DEVIATIONS | 1.03 | 1.57 | 0.86 | 0.99 | 1.09 | 1.08 |
| | 0.95 | 0.88 | 1.12 | 1.21 | 1.11 | 1.31 |
| **RUNOFF** | | | | | | |





| | | | | | | |
|---|---|---|---|---|---|---|
| TOTALS | 0.121 | 0.363 | 1.928 | 4.660 | 0.751 | 0.006 |
| | 0.004 | 0.001 | 0.006 | 0.025 | 0.101 | 0.133 |
| STD. DEVIATIONS | 0.280 | 0.921 | 1.797 | 3.077 | 1.663 | 0.027 |
| | 0.021 | 0.004 | 0.017 | 0.082 | 0.307 | 0.265 |
| **EVAPOTRANSPIRATION** | | | | | | |
| TOTALS | 0.285 | 0.273 | 0.399 | 1.038 | 2.175 | 1.785 |
| | 4.470 | 1.168 | 1.008 | 0.813 | 0.421 | 0.318 |
| STD. DEVIATIONS | 0.048 | 0.048 | 0.133 | 0.616 | 0.626 | 0.837 |
| | 0.612 | 0.869 | 0.547 | 0.302 | 0.117 | 0.066 |
| **PERCOLATION/LEAKAGE THROUGH LAYER 3** | | | | | | |
| TOTALS | 0.0075 | 0.0056 | 0.1323 | 0.2249 | 0.4642 | 0.2722 |
| | 0.3083 | 0.0804 | 0.0348 | 0.0194 | 0.0693 | 0.0095 |
| STD. DEVIATIONS | 0.0126 | 0.0094 | 0.5519 | 0.5058 | 0.8375 | 0.4608 |
| | 0.3949 | 0.1490 | 0.0637 | 0.0340 | 0.3384 | 0.0160 |

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2015 THROUGH 2019

| | INCHES | | CU. FEET | PERCENT |
|---|---|---|---|---|
| PRECIPITATION | 23.80 | ( 4.657) | 86408.1 | 100.00 |
| RUNOFF | 8.099 | ( 3.4287) | 29397.62 | 34.022 |
| EVAPOTRANSPIRATION | 14.155 | ( 2.1464) | 51382.28 | 59.465 |
| PERCOLATION/LEAKAGE THROUGH LAYER 3 | 1.62826 | ( 1.41986) | 5910.584 | 6.84031 |
| CHANGE IN WATER STORAGE | -0.078 | ( 2.8501) | -282.36 | -0.327 |

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PEAK DAILY VALUES FOR YEARS 2015 THROUGH 2019

| | (INCHES) | (CU. FT.) |
|---|---|---|
| PRECIPITATION | 2.01 | 7296.300 |
| RUNOFF | 2.151 | 7809.3130 |
| PERCOLATION/LEAKAGE THROUGH LAYER 3 | 2.329689 | 8456.77246 |
| SNOW WATER | 16.97 | 61596.1133 |

| | |
|---|---|
| MAXIMUM VEG. SOIL WATER (VOL/VOL) | 0.4328 |
| MINIMUM VEG. SOIL WATER (VOL/VOL) | 0.2000 |

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FINAL WATER STORAGE AT END OF YEAR 2019

| LAYER | (INCHES) | (VOL/VOL) |
|---|---|---|
| 1 | 10.1956 | 0.2832 |
| 2 | 2.4560 | 0.1023 |
| 3 | 4.7746 | 0.1989 |
| SNOW WATER | 2.306 | |

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# Pole Canyon ODA 2015 - 2019

# Panel A Thin Topsoil Cover

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**              USAE WATERWAYS EXPERIMENT STATION                           **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************
```

```
PRECIPITATION DATA FILE:     C:\PREC8419.D4
TEMPERATURE DATA FILE:       \TEMP8419.D7
SOLAR RADIATION DATA FILE: \SOL8419.D13
EVAPOTRANSPIRATION DATA:     \TTCEVAPO.D11
SOIL AND DESIGN DATA FILE: \TTCSOIL.D10
OUTPUT DATA FILE:            C:\TTCOUT19.OUT
```

```
TIME:  31:37     DATE:   6/ 1/2020
```

```
******************************************************************************

     TITLE: Thin Topsoil Cover: Topsoil 0.5 ft

******************************************************************************
```

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

```
                          LAYER  1
                          --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER   0
     THICKNESS                  =     6.00   INCHES
```





```
     POROSITY                   =      0.4910 VOL/VOL
     FIELD CAPACITY             =      0.2000 VOL/VOL
     WILTING POINT              =      0.1100 VOL/VOL
     INITIAL SOIL WATER CONTENT =      0.2879 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.890000010000E-04 CM/SEC
```

```
                          LAYER  2
                          --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER   0
     THICKNESS                  =     24.00   INCHES
     POROSITY                   =      0.3650 VOL/VOL
     FIELD CAPACITY             =      0.2390 VOL/VOL
     WILTING POINT              =      0.1020 VOL/VOL
     INITIAL SOIL WATER CONTENT =      0.1512 VOL/VOL
     EFFECTIVE SAT. HYD. COND.  = 0.260000005000E-01 CM/SEC
```

```
           GENERAL DESIGN AND EVAPORATIVE ZONE DATA
           ----------------------------------------

  NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

  SCS RUNOFF CURVE NUMBER            =    86.00
  FRACTION OF AREA ALLOWING RUNOFF   =   100.0    PERCENT
  AREA PROJECTED ON HORIZONTAL PLANE =     1.000  ACRES
  EVAPORATIVE ZONE DEPTH             =    24.0    INCHES
  INITIAL WATER IN EVAPORATIVE ZONE  =     4.456  INCHES
  UPPER LIMIT OF EVAPORATIVE STORAGE =     9.516  INCHES
  LOWER LIMIT OF EVAPORATIVE STORAGE =     2.496  INCHES
  INITIAL SNOW WATER                 =     3.576  INCHES
  INITIAL WATER IN LAYER MATERIALS   =     5.356  INCHES
  TOTAL INITIAL WATER                =     8.932  INCHES
  TOTAL SUBSURFACE INFLOW            =     0.00   INCHES/YEAR
```

```
           EVAPOTRANSPIRATION AND WEATHER DATA
           -----------------------------------

  NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
           POCATELLO            IDAHO
```

STATION LATITUDE = 42.68 DEGREES
MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 150
END OF GROWING SEASON (JULIAN DATE) = 240
EVAPORATIVE ZONE DEPTH = 24.0 INCHES
AVERAGE ANNUAL WIND SPEED = 3.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 69.70 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 54.70 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 45.10 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 67.70 %

NOTE: PRECIPITATION DATA FOR SMOKY CANYON MINE IDAHO
WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR SMOKY CANYON MINE IDAHO
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO
AND STATION LATITUDE = 42.68 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2015

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 1.38 | 2.23 | 1.01 | 2.57 | 4.74 | 1.37 |
| | 1.80 | 0.96 | 2.54 | 0.64 | 3.17 | 3.86 |
| RUNOFF | 0.134 | 2.614 | 0.264 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.002 | 0.020 | 0.000 | 0.014 | 0.281 |
| EVAPOTRANSPIRATION | 0.299 | 0.319 | 0.912 | 2.855 | 4.001 | 2.398 |
| | 2.105 | 1.009 | 1.843 | 0.752 | 0.517 | 0.299 |





| | | | | | | |
|---|---|---|---|---|---|---|
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 2.9671 | 0.0945 | 0.0873 | 0.1821 |
| LAYER 2 | 0.0446 | 0.0167 | 0.0081 | 0.0275 | 0.0093 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2015

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 26.27 | 95360.148 | 100.00 |
| RUNOFF | 3.327 | 12076.168 | 12.66 |
| EVAPOTRANSPIRATION | 17.310 | 62834.012 | 65.89 |
| PERC./LEAKAGE THROUGH LAYER 2 | 3.437215 | 12477.091 | 13.08 |
| CHANGE IN WATER STORAGE | 2.196 | 7972.819 | 8.36 |
| SOIL WATER AT START OF YEAR | 6.562 | 23821.758 | |
| SOIL WATER AT END OF YEAR | 5.829 | 21159.752 | |
| SNOW WATER AT START OF YEAR | 0.948 | 3440.371 | 3.61 |
| SNOW WATER AT END OF YEAR | 3.877 | 14075.196 | 14.76 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.061 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2016

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.41 | 1.98 | 3.63 | 2.15 | 3.60 | 0.40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 0.16 | 0.00 | 4.22 | 6.24 | 1.28 | 2.83 |
| RUNOFF | 0.000 | 0.770 | 4.587 | 2.995 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.066 | 0.270 | 0.000 | 0.569 |
| EVAPOTRANSPIRATION | 0.208 | 0.324 | 0.289 | 2.287 | 3.346 | 1.385 |
| | 0.261 | 0.000 | 1.670 | 1.757 | 0.900 | 0.222 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 4.0694 | 0.0405 | 0.1155 |
| LAYER 2 | 0.0663 | 0.0000 | 0.3603 | 3.6209 | 1.0128 | 0.0208 |

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ANNUAL TOTALS FOR YEAR 2016

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 28.90 | 104906.992 | 100.00 |
| RUNOFF | 9.257 | 33603.824 | 32.03 |
| EVAPOTRANSPIRATION | 12.650 | 45919.883 | 43.77 |
| PERC./LEAKAGE THROUGH LAYER 2 | 9.306512 | 33782.637 | 32.20 |
| CHANGE IN WATER STORAGE | -2.314 | -8399.343 | -8.01 |
| SOIL WATER AT START OF YEAR | 5.829 | 21159.752 | |
| SOIL WATER AT END OF YEAR | 5.593 | 20304.285 | |
| SNOW WATER AT START OF YEAR | 3.877 | 14075.196 | 13.42 |
| SNOW WATER AT END OF YEAR | 1.799 | 6531.319 | 6.23 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.010 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2017

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 4.63 | 5.97 | 2.27 | 4.34 | 2.02 | 0.93 |
| | 0.34 | 1.74 | 3.25 | 0.24 | 3.85 | 1.80 |
| RUNOFF | 0.000 | 4.228 | 5.917 | 0.000 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.035 |
| EVAPOTRANSPIRATION | 0.252 | 0.182 | 0.799 | 2.624 | 3.194 | 1.002 |
| | 1.051 | 1.576 | 1.663 | 1.589 | 0.780 | 0.441 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 3.3722 | 1.2000 | 0.6459 | 0.0567 |
| LAYER 2 | 0.0422 | 0.0212 | 0.0099 | 0.0502 | 1.2875 | 0.2200 |

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ANNUAL TOTALS FOR YEAR 2017

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 31.38 | 113909.391 | 100.00 |
| RUNOFF | 10.183 | 36965.457 | 32.45 |
| EVAPOTRANSPIRATION | 15.153 | 55006.859 | 48.29 |
| PERC./LEAKAGE THROUGH LAYER 2 | 6.905549 | 25067.141 | 22.01 |
| CHANGE IN WATER STORAGE | -0.862 | -3130.055 | -2.75 |
| SOIL WATER AT START OF YEAR | 5.593 | 20304.285 | |
| SOIL WATER AT END OF YEAR | 5.530 | 20072.744 | |
| SNOW WATER AT START OF YEAR | 1.799 | 6531.319 | 5.73 |
| SNOW WATER AT END OF YEAR | 1.001 | 3632.805 | 3.19 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.012 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2018

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.22 | 3.00 | 2.85 | 3.39 | 1.58 | 0.77 |
| | 0.64 | 0.69 | 0.19 | 1.60 | 2.73 | 1.45 |
| RUNOFF | 0.578 | 0.631 | 3.502 | 2.940 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.355 | 0.254 | 0.314 | 1.332 | 2.251 | 0.943 |
| | 0.567 | 0.850 | 0.009 | 1.316 | 0.391 | 0.385 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 3.5608 | 0.1744 | 0.0324 |
| LAYER 2 | 0.0112 | 0.1216 | 0.0013 | 0.0037 | 0.0144 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2018

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 21.11 | 76629.312 | 100.00 |
| RUNOFF | 7.651 | 27771.793 | 36.24 |
| EVAPOTRANSPIRATION | 8.966 | 32547.869 | 42.47 |
| PERC./LEAKAGE THROUGH LAYER 2 | 3.919797 | 14228.862 | 18.57 |
| CHANGE IN WATER STORAGE | 0.573 | 2080.790 | 2.72 |
| SOIL WATER AT START OF YEAR | 5.530 | 20072.744 | |
| SOIL WATER AT END OF YEAR | 4.474 | 16239.320 | |
| SNOW WATER AT START OF YEAR | 1.001 | 3632.805 | 4.74 |





| | | | |
|---|---|---|---|
| SNOW WATER AT END OF YEAR | 2.630 | 9547.020 | 12.46 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.005 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.87 | 2.60 | 1.70 | 2.57 | 3.60 | 0.98 |
| | 0.70 | 0.00 | 3.37 | 2.63 | 1.31 | 1.67 |
| RUNOFF | 0.040 | 0.000 | 1.407 | 6.196 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.048 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.324 | 0.222 | 0.361 | 1.446 | 2.938 | 1.548 |
| | 0.960 | 0.109 | 2.219 | 1.376 | 0.735 | 0.363 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 3.0950 | 0.0938 | 0.0902 |
| LAYER 2 | 0.0065 | 0.0026 | 0.0000 | 0.1558 | 0.5414 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2019

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 24.00 | 87119.969 | 100.00 |
| RUNOFF | 7.692 | 27921.727 | 32.05 |
| EVAPOTRANSPIRATION | 12.600 | 45739.383 | 52.50 |
| PERC./LEAKAGE THROUGH LAYER 2 | 3.985264 | 14466.510 | 16.61 |

| | | | |
|---|---|---|---|
| CHANGE IN WATER STORAGE | -0.278 | -1007.584 | -1.16 |
| SOIL WATER AT START OF YEAR | 4.474 | 16239.320 | |
| SOIL WATER AT END OF YEAR | 4.520 | 16409.291 | |
| SNOW WATER AT START OF YEAR | 2.630 | 9547.020 | 10.96 |
| SNOW WATER AT END OF YEAR | 2.306 | 8369.465 | 9.61 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.061 | 0.00 |

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 2015 THROUGH 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| **PRECIPITATION** | | | | | | |
| TOTALS | 2.45 | 2.51 | 2.16 | 2.43 | 2.42 | 1.26 |
| | 1.00 | 1.11 | 1.49 | 2.20 | 2.38 | 2.39 |
| STD. DEVIATIONS | 1.03 | 1.57 | 0.86 | 0.99 | 1.09 | 1.08 |
| | 0.95 | 0.88 | 1.12 | 1.21 | 1.11 | 1.31 |
| **RUNOFF** | | | | | | |
| TOTALS | 0.106 | 0.319 | 1.846 | 4.672 | 0.767 | 0.000 |
| | 0.004 | 0.002 | 0.006 | 0.019 | 0.090 | 0.114 |
| STD. DEVIATIONS | 0.259 | 0.822 | 1.780 | 3.076 | 1.722 | 0.002 |
| | 0.020 | 0.006 | 0.016 | 0.062 | 0.284 | 0.233 |
| **EVAPOTRANSPIRATION** | | | | | | |
| TOTALS | 0.285 | 0.273 | 0.405 | 1.204 | 2.457 | 1.693 |
| | 1.100 | 1.017 | 1.178 | 1.073 | 0.534 | 0.317 |
| STD. DEVIATIONS | 0.048 | 0.048 | 0.149 | 0.783 | 0.758 | 1.111 |
| | 0.839 | 0.708 | 0.694 | 0.488 | 0.164 | 0.067 |





PERCOLATION/LEAKAGE THROUGH LAYER 2

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTALS | 0.0000 | 0.0000 | 0.3913 | 1.6216 | 1.4007 | 0.1116 |
| | 0.0648 | 0.0311 | 0.0276 | 0.2813 | 0.3895 | 0.0622 |
| STD. DEVIATIONS | 0.0000 | 0.0000 | 1.0028 | 1.5152 | 1.7034 | 0.1358 |
| | 0.0737 | 0.0248 | 0.0590 | 0.7220 | 0.5170 | 0.2235 |

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2015 THROUGH 2019

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 23.80 ( 4.657) | 86408.1 | 100.00 |
| RUNOFF | 7.944 ( 3.4928) | 28837.24 | 33.373 |
| EVAPOTRANSPIRATION | 11.537 ( 2.4058) | 41877.80 | 48.465 |
| PERCOLATION/LEAKAGE THROUGH LAYER 2 | 4.38165 ( 1.36114) | 15905.395 | 18.40730 |
| CHANGE IN WATER STORAGE | -0.058 ( 2.3674) | -212.32 | -0.246 |

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PEAK DAILY VALUES FOR YEARS 2015 THROUGH 2019

| | (INCHES) | (CU. FT.) |
|---|---|---|
| PRECIPITATION | 2.01 | 7296.300 |
| RUNOFF | 2.189 | 7947.8101 |
| PERCOLATION/LEAKAGE THROUGH LAYER 2 | 4.324773 | 15698.92680 |
| SNOW WATER | 16.97 | 61596.1133 |
| MAXIMUM VEG. SOIL WATER (VOL/VOL) | 0.3456 | |

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1040

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FINAL WATER STORAGE AT END OF YEAR 2019

| LAYER | (INCHES) | (VOL/VOL) |
|---|---|---|
| 1 | 1.2873 | 0.2146 |
| 2 | 3.2331 | 0.1347 |
| SNOW WATER | 2.306 | |

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**Pole Canyon ODA 2015 - 2019**

**Undisturbed Natural Ground**

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                 HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\PREC8419.D4
TEMPERATURE DATA FILE:      \TEMP8419.D7
SOLAR RADIATION DATA FILE:  \SOL8419.D13
EVAPOTRANSPIRATION DATA:    \UNGEVAPO.D11
SOIL AND DESIGN DATA FILE:  \UNGSOIL.D10
OUTPUT DATA FILE:           C:\UNGOUT19.OUT


TIME:  32:32     DATE:   6/ 1/2020


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     TITLE: Undisturbed Natural Ground

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     NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   0
           THICKNESS                   =     36.00   INCHES
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           POROSITY                    =      0.4910 VOL/VOL
           FIELD CAPACITY              =      0.2000 VOL/VOL
           WILTING POINT               =      0.1100 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.1864 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   = 0.890000010000E-04 CM/SEC


                   GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                   ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER            =    86.00
FRACTION OF AREA ALLOWING RUNOFF   =   100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE =     1.000  ACRES
EVAPORATIVE ZONE DEPTH             =    36.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE  =     6.712  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE =    17.676  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE =     3.960  INCHES
INITIAL SNOW WATER                 =     3.576  INCHES
INITIAL WATER IN LAYER MATERIALS   =     6.712  INCHES
TOTAL INITIAL WATER                =    10.288  INCHES
TOTAL SUBSURFACE INFLOW            =     0.00   INCHES/YEAR


                    EVAPOTRANSPIRATION AND WEATHER DATA
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 NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          POCATELLO             IDAHO

     STATION LATITUDE                        = 42.68 DEGREES
     MAXIMUM LEAF AREA INDEX                 =   3.50
     START OF GROWING SEASON (JULIAN DATE)   =    150
     END OF GROWING SEASON (JULIAN DATE)     =    240
     EVAPORATIVE ZONE DEPTH                  = 36.0  INCHES
     AVERAGE ANNUAL WIND SPEED               =   3.60 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 69.70 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 54.70 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 45.10 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 67.70 %


 NOTE:  PRECIPITATION DATA FOR     SMOKY CANYON MINE          IDAHO
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WAS ENTERED BY THE USER.

NOTE: TEMPERATURE DATA FOR SMOKY CANYON MINE IDAHO
WAS ENTERED BY THE USER.

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO
AND STATION LATITUDE = 42.68 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2015

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 1.38 | 2.23 | 1.01 | 2.57 | 4.74 | 1.37 |
| | 1.80 | 0.96 | 2.54 | 0.64 | 3.17 | 3.86 |
| RUNOFF | 0.151 | 2.643 | 0.259 | 0.006 | 0.099 | 0.000 |
| | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.328 |
| EVAPOTRANSPIRATION | 0.299 | 0.319 | 0.565 | 1.625 | 2.659 | 2.781 |
| | 5.702 | 0.894 | 0.846 | 0.719 | 0.488 | 0.299 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 0.8848 | 1.7445 | 0.9682 |
| LAYER 1 | 0.7626 | 0.2804 | 0.0945 | 0.0243 | 0.3298 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2015

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 26.27 | 95360.148 | 100.00 |





| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| RUNOFF | 3.500 | 12706.663 | 13.32 |
| EVAPOTRANSPIRATION | 17.196 | 62420.555 | 65.46 |
| PERC./LEAKAGE THROUGH LAYER 1 | 5.089132 | 18473.551 | 19.37 |
| CHANGE IN WATER STORAGE | 0.485 | 1759.305 | 1.84 |
| SOIL WATER AT START OF YEAR | 9.640 | 34994.266 | |
| SOIL WATER AT END OF YEAR | 7.195 | 26118.748 | |
| SNOW WATER AT START OF YEAR | 0.948 | 3440.371 | 3.61 |
| SNOW WATER AT END OF YEAR | 3.877 | 14075.196 | 14.76 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.076 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2016

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.41 | 1.98 | 3.63 | 2.15 | 3.60 | 0.40 |
| | 0.16 | 0.00 | 4.22 | 6.24 | 1.28 | 2.83 |
| RUNOFF | 0.000 | 0.795 | 4.073 | 2.770 | 0.073 | 0.000 |
| | 0.000 | 0.000 | 0.078 | 0.457 | 0.000 | 0.662 |
| EVAPOTRANSPIRATION | 0.208 | 0.324 | 0.289 | 1.308 | 2.504 | 1.836 |
| | 4.015 | 0.000 | 0.759 | 1.116 | 0.370 | 0.222 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 0.7719 | 0.6135 | 0.9559 |
| LAYER 1 | 0.9053 | 0.0000 | 0.3010 | 1.0651 | 1.7664 | 0.0686 |

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ANNUAL TOTALS FOR YEAR 2016

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 28.90 | 104906.992 | 100.00 |
| RUNOFF | 8.908 | 32336.348 | 30.82 |
| EVAPOTRANSPIRATION | 12.953 | 47017.898 | 44.82 |
| PERC./LEAKAGE THROUGH LAYER 1 | 6.447826 | 23405.609 | 22.31 |
| CHANGE IN WATER STORAGE | 0.591 | 2147.144 | 2.05 |
| SOIL WATER AT START OF YEAR | 7.195 | 26118.748 | |
| SOIL WATER AT END OF YEAR | 9.865 | 35809.770 | |
| SNOW WATER AT START OF YEAR | 3.877 | 14075.196 | 13.42 |
| SNOW WATER AT END OF YEAR | 1.799 | 6531.319 | 6.23 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.009 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2017

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 4.63 | 5.97 | 2.27 | 4.34 | 2.02 | 0.93 |
| | 0.34 | 1.74 | 3.25 | 0.24 | 3.85 | 1.80 |
| RUNOFF | 0.000 | 4.601 | 5.909 | 0.038 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.031 | 0.054 |
| EVAPOTRANSPIRATION | 0.252 | 0.182 | 0.632 | 1.750 | 2.251 | 1.802 |
| | 4.469 | 0.910 | 0.856 | 0.354 | 0.614 | 0.441 |





| | | | | | | |
|---|---|---|---|---|---|---|
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 1.2490 | 2.1014 | 1.7195 | 0.3485 |
| LAYER 1 | 0.8995 | 0.6254 | 1.0800 | 0.4528 | 0.1645 | 0.0369 |

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ANNUAL TOTALS FOR YEAR 2017

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 31.38 | 113909.391 | 100.00 |
| RUNOFF | 10.633 | 38596.852 | 33.88 |
| EVAPOTRANSPIRATION | 14.512 | 52680.051 | 46.25 |
| PERC./LEAKAGE THROUGH LAYER 1 | 8.677586 | 31499.635 | 27.65 |
| CHANGE IN WATER STORAGE | -2.443 | -8867.131 | -7.78 |
| SOIL WATER AT START OF YEAR | 9.865 | 35809.770 | |
| SOIL WATER AT END OF YEAR | 8.221 | 29841.152 | |
| SNOW WATER AT START OF YEAR | 1.799 | 6531.319 | 5.73 |
| SNOW WATER AT END OF YEAR | 1.001 | 3632.805 | 3.19 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.021 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2018

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.22 | 3.00 | 2.85 | 3.39 | 1.58 | 0.77 |
| | 0.64 | 0.69 | 0.19 | 1.60 | 2.73 | 1.45 |

| | | | | | | |
|---|---|---|---|---|---|---|
| RUNOFF | 0.680 | 0.708 | 3.458 | 2.802 | 0.000 | 0.000 |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| EVAPOTRANSPIRATION | 0.355 | 0.254 | 0.314 | 0.959 | 2.138 | 1.686 |
| | 4.203 | 0.371 | 0.116 | 0.663 | 0.312 | 0.385 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 0.0028 | 0.8624 | 0.2491 |
| LAYER 1 | 0.9325 | 0.3016 | 0.0605 | 0.0366 | 0.4182 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2018

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 21.11 | 76629.312 | 100.00 |
| RUNOFF | 7.648 | 27761.186 | 36.23 |
| EVAPOTRANSPIRATION | 11.756 | 42673.156 | 55.69 |
| PERC./LEAKAGE THROUGH LAYER 1 | 2.863564 | 10394.739 | 13.56 |
| CHANGE IN WATER STORAGE | -1.157 | -4199.788 | -5.48 |
| SOIL WATER AT START OF YEAR | 8.221 | 29841.152 | |
| SOIL WATER AT END OF YEAR | 5.434 | 19727.148 | |
| SNOW WATER AT START OF YEAR | 1.001 | 3632.805 | 4.74 |
| SNOW WATER AT END OF YEAR | 2.630 | 9547.020 | 12.46 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | 0.016 | 0.00 |

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2019





| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| PRECIPITATION | 2.87 | 2.60 | 1.70 | 2.57 | 3.60 | 0.98 |
| | 0.70 | 0.00 | 3.37 | 2.63 | 1.31 | 1.67 |
| RUNOFF | 0.040 | 0.000 | 1.278 | 5.431 | 0.018 | 0.000 |
| | 0.000 | 0.000 | 0.067 | 0.000 | 0.000 | 0.001 |
| EVAPOTRANSPIRATION | 0.324 | 0.222 | 0.361 | 0.876 | 2.434 | 1.905 |
| | 3.650 | 0.085 | 1.017 | 0.813 | 0.245 | 0.363 |
| PERCOLATION/LEAKAGE THROUGH | 0.0000 | 0.0000 | 0.0000 | 0.1112 | 0.8795 | 0.6880 |
| LAYER 1 | 0.7602 | 0.0613 | 0.1899 | 1.0335 | 0.5069 | 0.0000 |

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ANNUAL TOTALS FOR YEAR 2019

| | INCHES | CU. FEET | PERCENT |
|---|---|---|---|
| PRECIPITATION | 24.00 | 87119.969 | 100.00 |
| RUNOFF | 6.836 | 24816.191 | 28.49 |
| EVAPOTRANSPIRATION | 12.295 | 44631.891 | 51.23 |
| PERC./LEAKAGE THROUGH LAYER 1 | 4.230443 | 15356.510 | 17.63 |
| CHANGE IN WATER STORAGE | 0.638 | 2315.422 | 2.66 |
| SOIL WATER AT START OF YEAR | 5.434 | 19727.148 | |
| SOIL WATER AT END OF YEAR | 6.397 | 23220.127 | |
| SNOW WATER AT START OF YEAR | 2.630 | 9547.020 | 10.96 |
| SNOW WATER AT END OF YEAR | 2.306 | 8369.465 | 9.61 |
| ANNUAL WATER BUDGET BALANCE | 0.0000 | -0.040 | 0.00 |

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 2015 THROUGH 2019

| | JAN/JUL | FEB/AUG | MAR/SEP | APR/OCT | MAY/NOV | JUN/DEC |
|---|---|---|---|---|---|---|
| **PRECIPITATION** | | | | | | |
| TOTALS | 2.45 | 2.51 | 2.16 | 2.43 | 2.42 | 1.26 |
| | 1.00 | 1.11 | 1.49 | 2.20 | 2.38 | 2.39 |
| STD. DEVIATIONS | 1.03 | 1.57 | 0.86 | 0.99 | 1.09 | 1.08 |
| | 0.95 | 0.88 | 1.12 | 1.21 | 1.11 | 1.31 |
| **RUNOFF** | | | | | | |
| TOTALS | 0.105 | 0.335 | 1.743 | 4.284 | 0.707 | 0.009 |
| | 0.006 | 0.001 | 0.009 | 0.027 | 0.094 | 0.124 |
| STD. DEVIATIONS | 0.241 | 0.878 | 1.671 | 2.840 | 1.576 | 0.036 |
| | 0.029 | 0.004 | 0.025 | 0.088 | 0.289 | 0.246 |
| **EVAPOTRANSPIRATION** | | | | | | |
| TOTALS | 0.285 | 0.273 | 0.384 | 0.865 | 1.979 | 1.850 |
| | 3.897 | 0.784 | 0.625 | 0.586 | 0.367 | 0.317 |
| STD. DEVIATIONS | 0.048 | 0.048 | 0.097 | 0.426 | 0.395 | 0.613 |
| | 0.980 | 0.761 | 0.325 | 0.220 | 0.110 | 0.067 |
| **PERCOLATION/LEAKAGE THROUGH LAYER 1** | | | | | | |
| TOTALS | 0.0000 | 0.0000 | 0.0624 | 0.4261 | 0.7951 | 0.5514 |
| | 0.8085 | 0.3226 | 0.2879 | 0.4782 | 0.4298 | 0.0293 |
| STD. DEVIATIONS | 0.0000 | 0.0000 | 0.2373 | 0.5012 | 0.5064 | 0.4680 |
| | 0.2032 | 0.2549 | 0.2387 | 0.4075 | 0.4240 | 0.1073 |

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2015 THROUGH 2019





| | INCHES | | CU. FEET | PERCENT |
|---|---|---|---|---|
| PRECIPITATION | 23.80 | ( 4.657) | 86408.1 | 100.00 |
| RUNOFF | 7.444 | ( 3.1685) | 27021.61 | 31.272 |
| EVAPOTRANSPIRATION | 12.213 | ( 1.9809) | 44332.14 | 51.306 |
| PERCOLATION/LEAKAGE THROUGH LAYER 1 | 4.19126 | ( 1.43179) | 15214.263 | 17.60745 |
| CHANGE IN WATER STORAGE | -0.044 | ( 2.2909) | -159.89 | -0.185 |

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PEAK DAILY VALUES FOR YEARS 2015 THROUGH 2019

| | (INCHES) | (CU. FT.) |
|---|---|---|
| PRECIPITATION | 2.01 | 7296.300 |
| RUNOFF | 2.097 | 7612.9517 |
| PERCOLATION/LEAKAGE THROUGH LAYER 1 | 0.277196 | 1006.22186 |
| SNOW WATER | 16.97 | 61596.1133 |
| MAXIMUM VEG. SOIL WATER (VOL/VOL) | 0.3432 | |
| MINIMUM VEG. SOIL WATER (VOL/VOL) | 0.1100 | |

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FINAL WATER STORAGE AT END OF YEAR 2019

| LAYER | (INCHES) | (VOL/VOL) |
|---|---|---|

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          1            6.3967         0.1777

     SNOW WATER        2.306

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